

STRUCTURE OF THE MICROCARD (BASIC INSTRUCTION)

A02 = How to use the microcard	1	2	3	4
A01 = Structure of microcard			SIS	
B01 = Trouble-shooting chart	A-***X*	X*XXX	XXXXX	XXXXX *XXXX X
	B-*	XXXXX	XXXXX	XXXXX XXX
	C-	XXXXX	XXXXX	XXXXX XXX
	D-	XXXXX	XXXXX	XXXXX XXX
	E-	XXXXX	XXXXX	XXXXX XX
	F-	XXXXX	XXXXX	XXX
	G-	XXXXX	XXXXX	XXXX
	H-			
	J-			
	K-			
	L-			
	M-			
N01 = Service Information	N-*	XXXXX	XXXXX	XXXXX XXX *X XX*
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			1	2
				Index

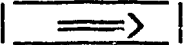
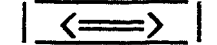
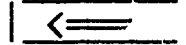

N28 = Table of contents and publication information

- 1 = Special features
2 = Safety and precautionary measures
3 = Test equipment and tools
4 = Installation position of components

- a. Read from left to right.
b. Title of micropicture (appears on each coordinate).

E16	Product/component/test step	
	Coordinate	

c. Limits of section

			
Beginning	Mid-section	End	One-page section

A01		=> <=
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HOW TO USE THE MICROCARD

Trouble-shooting instructions for
System: Electronic Traction Control
(ASR2-DKB)

Descriptions, photos, terminal designations,
and special features refer to the following
vehicle:
DB Type W/C 126 07.87 ->

These basic instructions are comprehensive
trouble-shooting instructions. They must not
be used as vehicle-specific instructions.
Caution! Descriptions and photographs may
deviate from the vehicle-specific brief
instructions.

Mandatory set values, terminal assignments
and special features should be taken from
the vehicle-specific brief instructions only.
For brief instructions, see table of contents
Microcard KFZ-00..

A02		=> <=
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SPECIAL FEATURES

Electronic Traction Control (ASR) combined with ABS2.

ASR takes action on (intervenes in) the brakes and E Gas.

New components:

- + Common controller for ABS and ASR,
- + ABS hydraulic modulator adapted to ASR,
- + ASR hydraulic modulator,
- + Pressure accumulator with charge pump.

A special adapter lead is required for testing.
The adapter lead has 2 pin terminals: one for connection to the ABS 2 LED tester for the ABS test and a second terminal for connection to the universal test adapter for testing the ASR.

NOTE !!

ABS and ASR are systems to aid vehicle safety.
Detailed knowledge of the systems is required for working on them.

Testing must be carried out only by trained personnel.

SAFETY AND PRECAUTIONARY MEASURES

ABS/ASR is fundamentally maintenance-free, however, the following must be observed whenever working on vehicles with ABS/ASR systems:

*Before loosening the brake lines from the hydraulic modulators, the charge pump or the pressure accumulator, the pressure accumulator must be emptied.

Caution! High pressure up to 200 bar!

Switch off the ignition. Open the bleeder screw SP3 on the ASR hydraulic modulator approx. 1 rotation and allow the brake fluid to flow into a container.

*When repairs are carried out to a brake caliper or to the brake hose at the wheel end, the system must be bled as usual.

*When repairs are carried out to the brake master cylinder, to the hydraulic modulators, the charge pump, or to the pressure accumulator, the system must be bled in accordance with the specified sequence (see bleeding specifications).

*Check all hydraulic connections for leaks.

*For safety reasons, the hydraulic modulators must not be repaired, but be exchanged only as complete units.

Exception: engine and valve relays in the ABS hydraulic modulator.

Apart from the brake-line connections, no screws at the hydraulic modulators may be loosened.
Once they are loosened, it is impossible to make the brake circuits leak-free ever again!

D a n g e r o f f a t a l a c c i d e n t
due to brake failure.

SAFETY AND PRECAUTIONARY MEASURES
(CONTINUED)

*After exchange of the hydraulic modulators, the charge pump, pressure accumulator, controller, wheel-speed sensors, and of the wiring harness, as well as after work procedures in which contact is made with the ABS/ASR assemblies (e.g. accident repair), the complete ABS/ASR system must be checked. Make sure that the brake lines and wheel-speed-sensor connections on the controller, and the wheel-speed-sensor plug connections are assigned correctly (see vehicle-specific terminal diagram).

*Disconnect the ABS/ASR control-unit plug before testing on the chassis dynamometer and on the dynamic brake analyzer.

*The vehicle may be towed with the front axle raised only when the ignition is switched off.

*Whenever welding with electric welding equipment, disconnect the plug from the electronic controller.

*Whenever painting the vehicle, the electronic controller may be loaded for a short time to a max. of + 95° C, and for a long time (approx. 2 hours) to a max. of + 85° C.

*Be sure to properly tighten the battery-cable terminals on the terminal posts of the battery.

*Do not use a fast charger for starting the engine.

*Never disconnect the battery from the vehicle electrical system while the engine is running.

SAFETY AND PRECAUTIONARY MEASURES
(CONTINUED)

*Disconnect the battery from the vehicle electrical system before fast charging.

*Make sure that all connectors of the wiring harness are seated properly.

*Never disconnect or connect the ABS/ASR wiring-harness plug from the controller when the ignition is switched on.

SAFETY AND PRECAUTIONARY MEASURES (CONTINUED)

Caution when handling brake fluid!

- a) Pour brake fluid only into containers from which it would be impossible to mistakenly consume the fluid internally.
(D a n g e r ! P o i s o n !)
- b) Even the slightest trace of mineral oil leads to failure of the brake system. Special care must be taken with colorless or yellow-tinted brake fluid, since the danger of a mix-up is greatest with such fluid.
If mineral oil is found in the brake system or there is a suspicion of mineral oil being in the brake system, the complete brake system must be thoroughly flushed out with brake fluid. In addition to this, the master cylinder must be replaced.
- c) Do not allow brake fluid to come into contact with the paintwork of the vehicle, since the fluid contains elements which act as solvents for paint.
- d) Brake fluid is exceedingly hygroscopic; i.e. it absorbs moisture from the air, thus reducing its boiling point. For this reason, brake fluid must be stored only in well-sealed storage containers.

N o t e :

As the operation time progresses, the boiling point of the brake fluid drops owing to the brake fluid permanently absorbing moisture from the atmosphere. If the brakes are subjected to very severe loading, this can, therefore, lead to vapor-bubble formation in the brake system.

Therefore, the brake fluid must be replaced on an annual basis, preferably in spring.

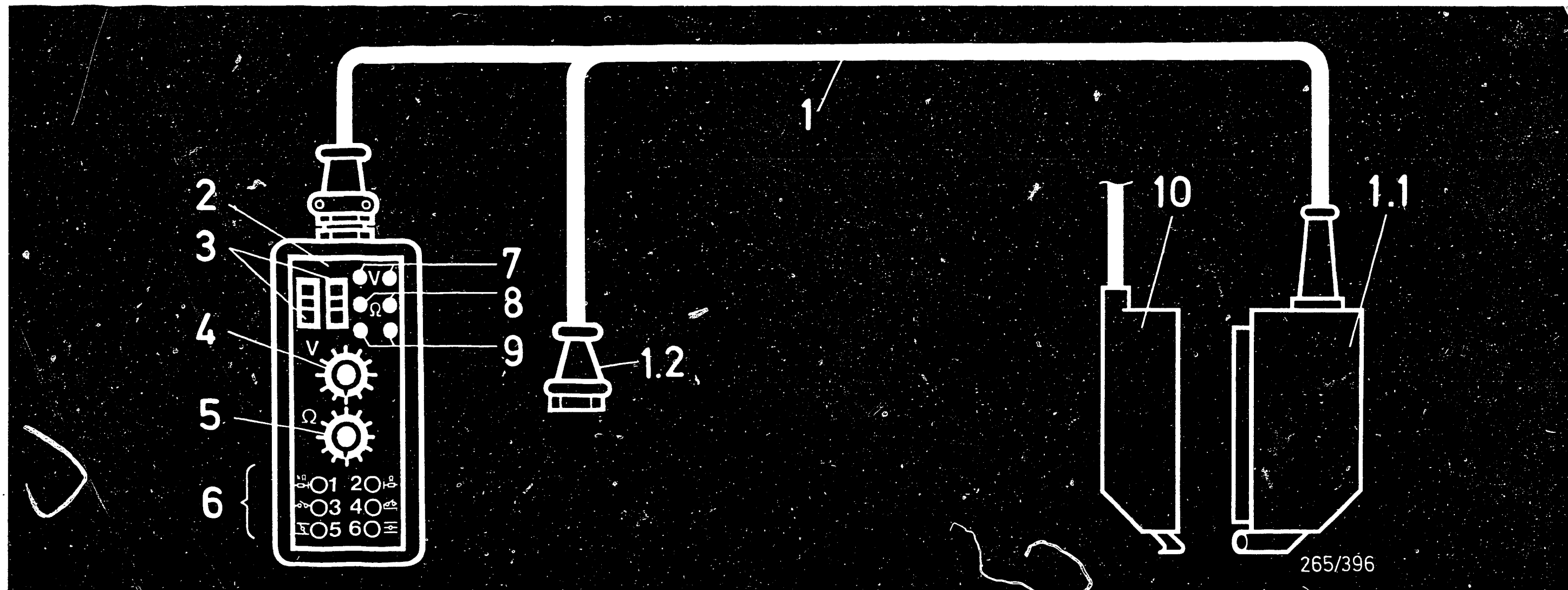
TEST EQUIPMENT AND TOOLS

Description	Designation	Part number
ABS 2 LED tester	KDAS 0003	Order from: Robert Bosch GmbH KH/VKD 3 Postfach 41 09 60 D-7500 Karlsruhe 41
Adapter lead for ABS and ASR		1 684 463 199
Universal test adapter for ASR test	ETT 018.01	0 684 101 801
Charging and bleeding device		E.g. FAG Part. No. W 0100 or Centro Selecta 010
Combination pressure tester		E.g. FAG Part No. W 0112
Multimeter		E.g. Metrawatt GmbH Type MA2H or Fluke Multimeter 23 or 75

Aids:

Use only genuine brake lines and brake fluid (or DOT 4) from the vehicle manufacturer!

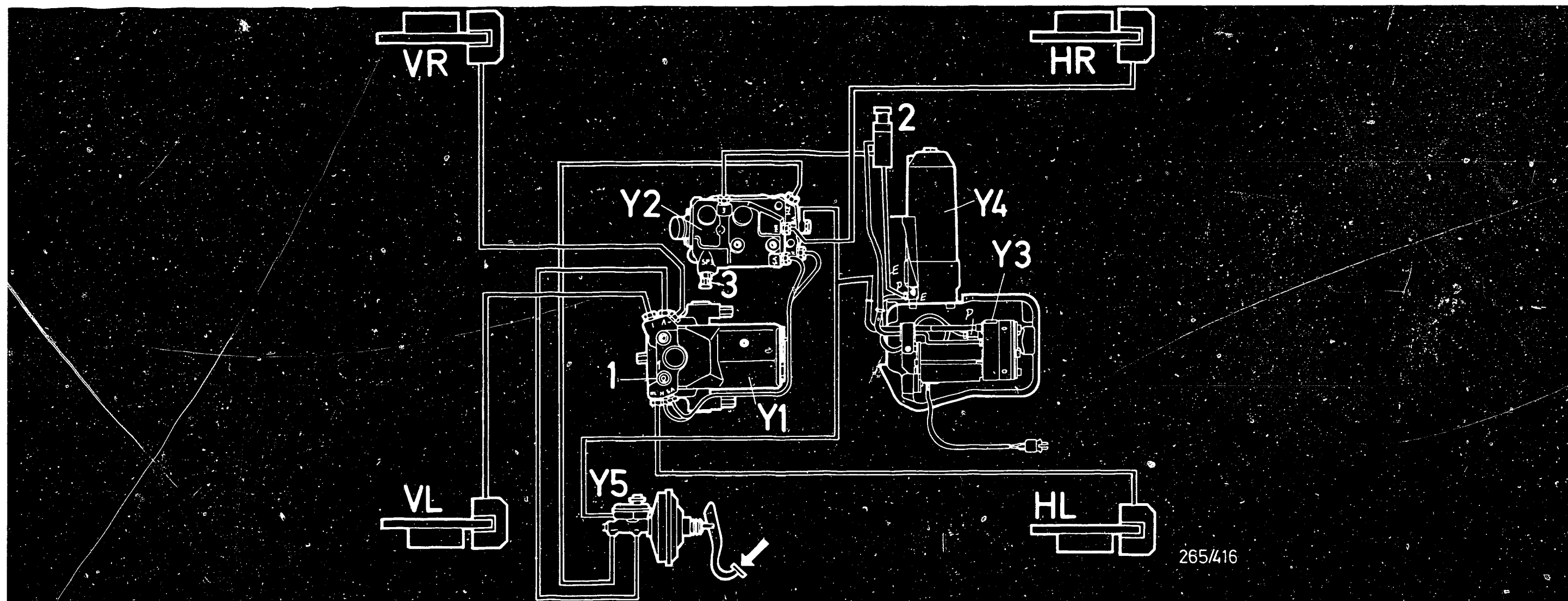
Grease for wheel-speed sensors	Molykote Longterm 2
Protective caps for brake lines	1 900 508 002 (100 pieces)
Protective caps for brake-line connections to hydraulic modulator	1 900 508 004 (100 pieces)



- 1 = Adapter lead (1 684 463 199)
- 1.1 = Connection to wiring harness
- 1.2 = Connection to ABS 2 LED tester
- 2 = Universal test adapter
(0 684 001 801)
- 3 = Measuring recess (for motortester)
- 4 = Program-selector switch "V"
- 5 = Program-selector switch "Ω"
- 6 = Keypad for simulation of operating conditions

- Push-button 1 = NTC II (engine), cold (-20°C)
- Push-button 2 = NTC II (engine), warm (+80°C)
- Push-button 3 = Pump activation
- Push-button 4 = Tank-ventilation valve
- Push-button 5 = Not used
- Push-button 6 = Not used
- 7 = Measuring sockets (voltage measurement)
- 8 = Measuring sockets (resistance measurement)
- 9 = Used only for self-diagnosis
- 10 = Wiring harness

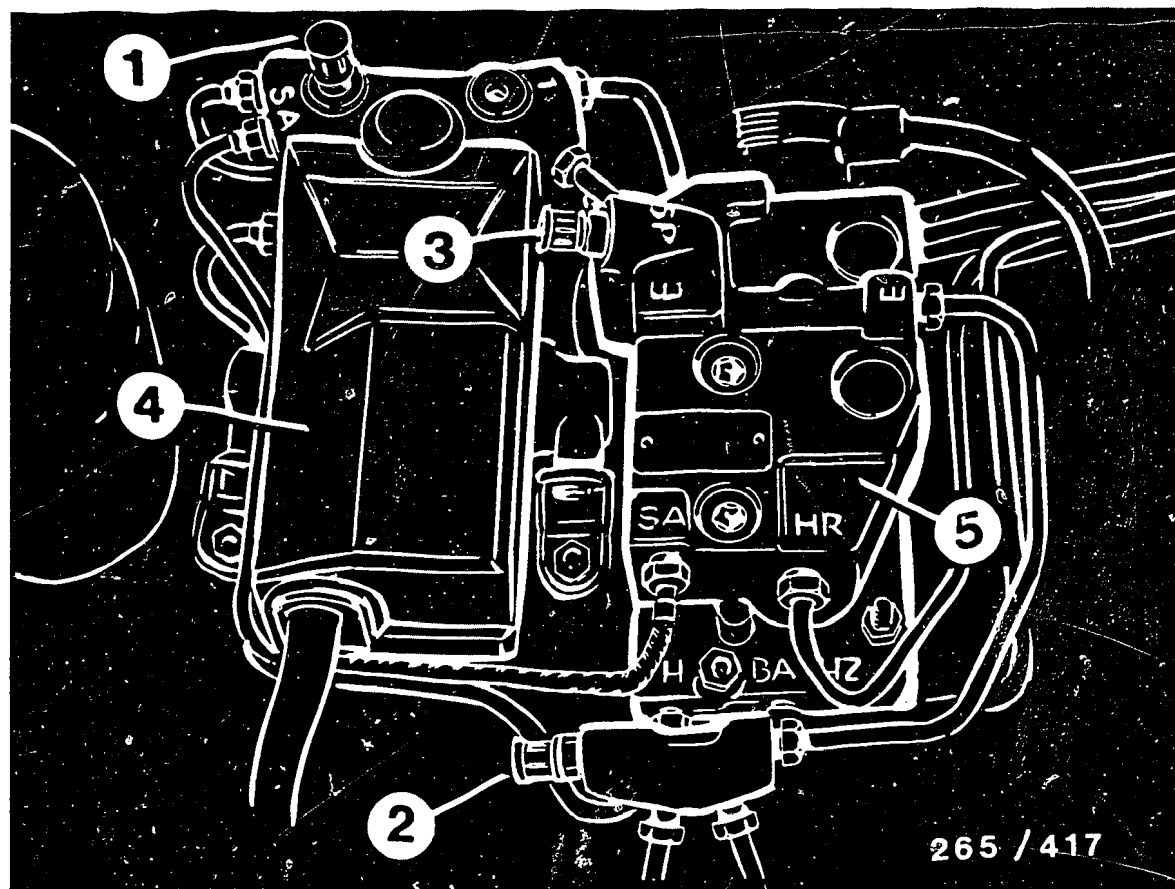
UNIVERSAL TEST ADAPTER WITH ADAPTER LEAD



1 = Bleeder screw 1
 2 = Bleeder screw 2
 3 = Bleeder screw SP 3
 BA = Reservoir connection
 E = Accumulator connection
 H = Rear axle
 HL,HR = Rear left, rear right
 HZ = Brake master cylinder (rear-axle circuit)
 l,r = Left, right

P = Pressure connection
 SA = Suction connection
 V = Front-axle brake circuit
 VL,VR = Front left, front right
 Y1 = ABS hydraulic modulator
 Y2 = ASR hydraulic modulator
 Y3 = Charge pump
 Y4 = Pressure accumulator
 Y5 = Brake master cylinder with reservoir

DIAGRAM OF HYDRAULIC CONNECTIONS

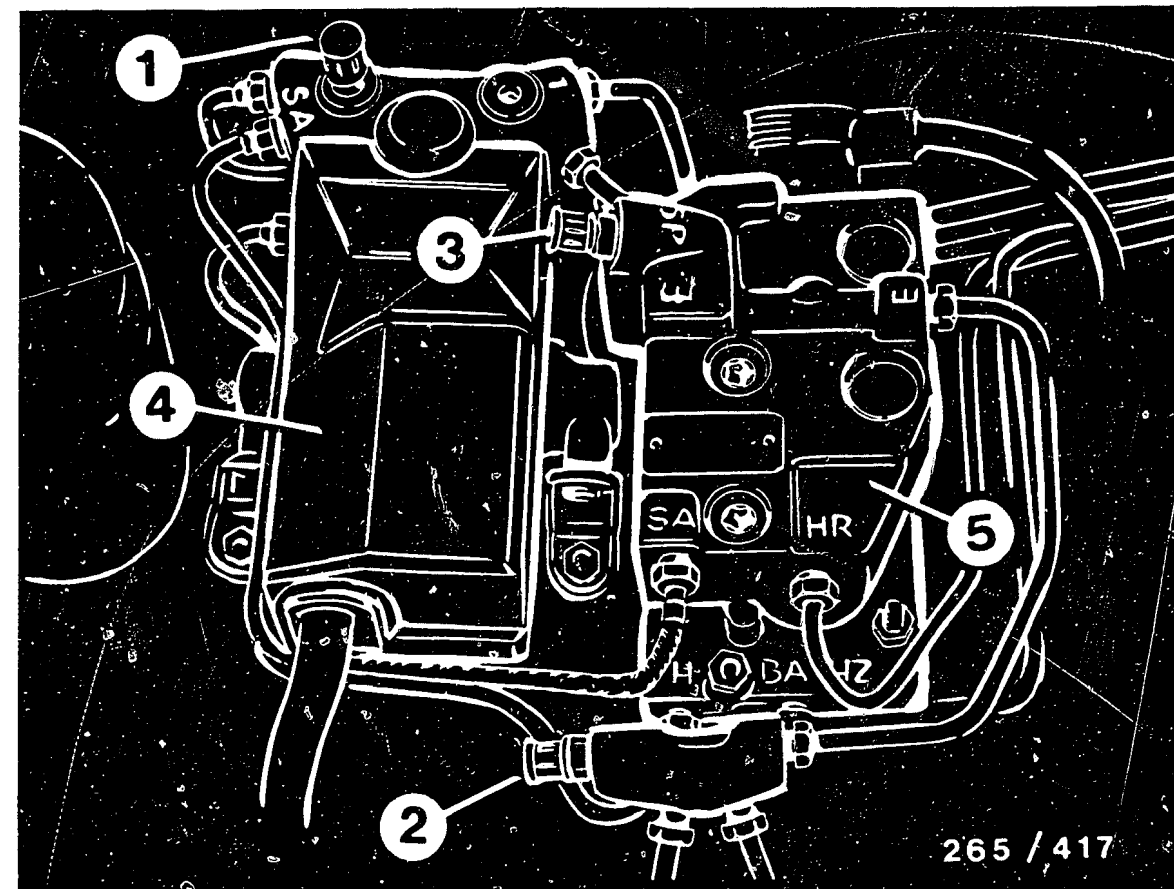


- 1 = Bleeder screw 1
- 2 = Bleeder screw 2
- 3 = Bleeder screw SP3
- 4 = ABS hydraulic modulator
- 5 = ASR hydraulic modulator

BLEEDING SPECIFICATION FOR ASR/DKB (DB)

Notes:

- + If repairs to brake parts are carried out at the wheel end, bleed as usual.
- + After repairs to one wheel, bleed on both sides.
- + If hydraulic ABS/ASR components or the brake master cylinder are exchanged, the following bleeding process must be carried out in its entirety.
- + After changing the brake fluid (annually), bleed the whole system.
- + Always observe the sequence of bleeding steps.



- 1 = Bleeder screw 1
- 2 = Bleeder screw 2
- 3 = Bleeder screw SP3
- 4 = ABS hydraulic modulator
- 5 = ASR hydraulic modulator

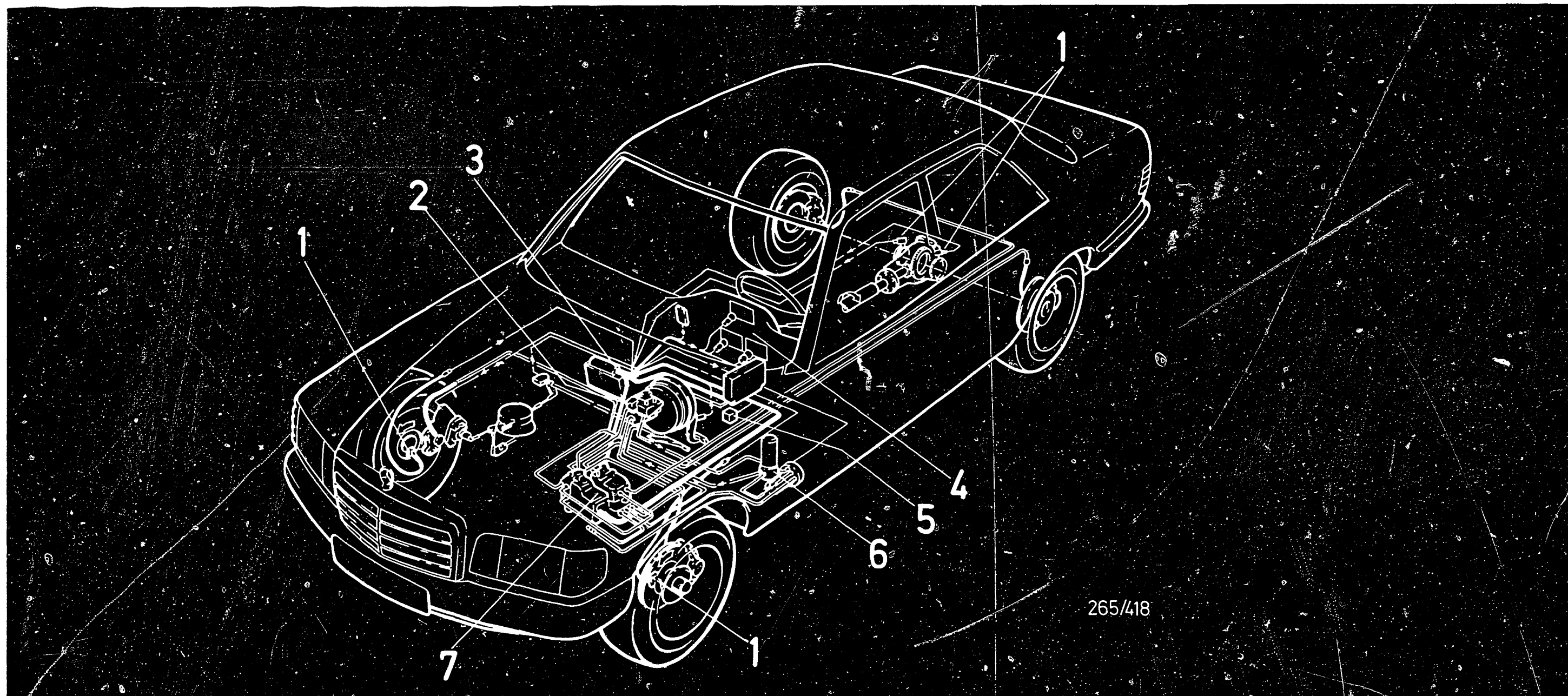
BLEEDING SPECIFICATION (Continued)

1. Ignition off.
Connect bleeding device in accordance with specifications and apply pressure (approx. 2 bar) to the reservoir.
2. Bleed the brake system as usual at the wheels. Rear right for approx. 1 minute.
3. Connect hose to bleeder connection 1 of the ABS hydraulic modulator and dangle other end of hose in a container.
Open bleeder connection 1 until bubble-free brake fluid flows out.

BLEEDING SPECIFICATIONS (Continued)

4. Empty the accumulator:
Ignition off. Connect hose to bleeder screw SP3 on ASR hydraulic modulator and dangle into container.
Open connection SP carefully and release pressure. Caution! High pressure up to 200 bar possible!
5. ABS/ASR controller must be connected.
Run engine at idle.
Connect hose to bleeder connection 2 and dangle into container.
Open bleeder connection until bubble-free brake fluid flows out.
6. Continue running engine at idle.
Connect hose to bleeder connection SP3 of the ASR hydraulic modulator and dangle into container.
Open bleeder connection SP3 carefully until bubble-free brake fluid escapes.
Seal SP 3 and wait until accumulator is charged.
Switch off ignition.
Note! If bleeding takes a long time, the controller switches the charge pump off.
No more brake fluid escapes and the ASR warning lamp lights up.
Remedy: switch off engine and restart. Continue bleeding.
7. Remove bleeding device.
8. After the engine is started, the accumulator is subsequently charged if necessary.
9. Top up reservoir to Max. mark.

For production reasons:
continued on the following
coordinate.

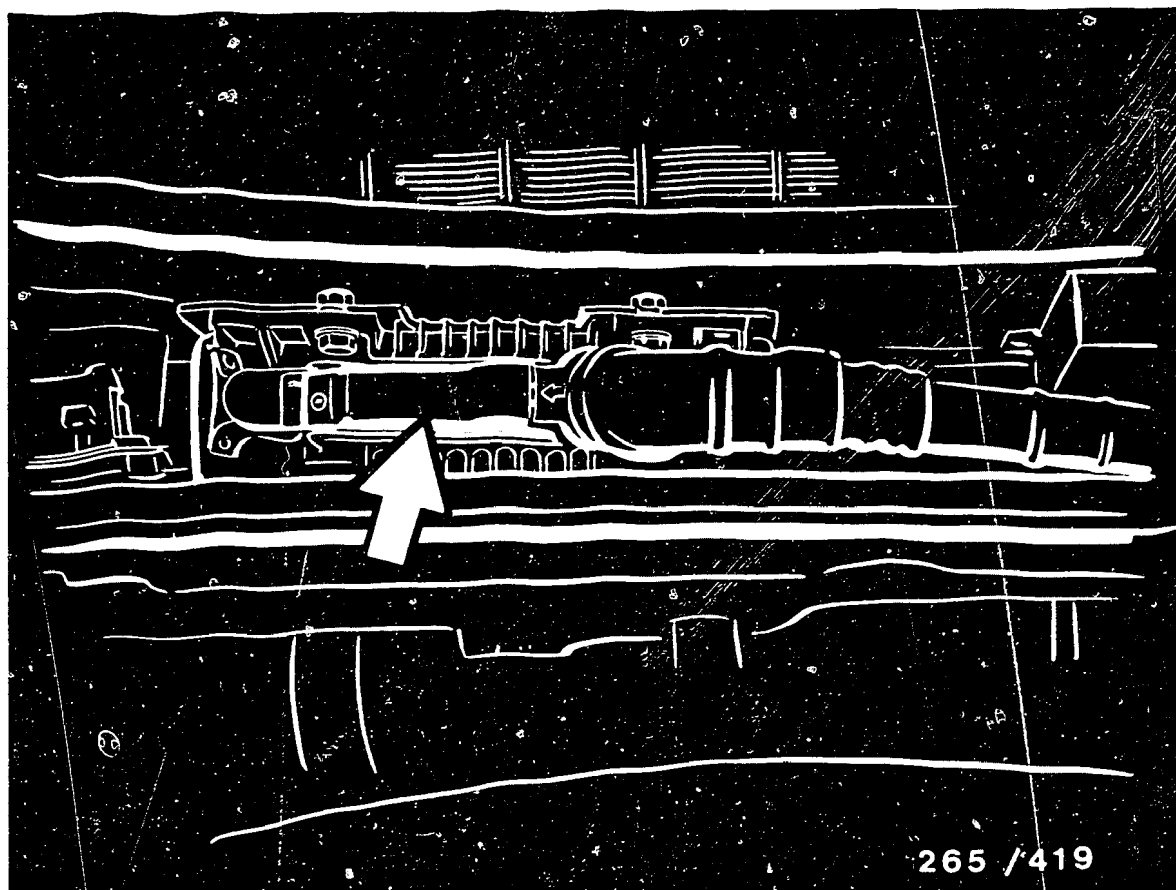


265/418

- 1 = Wheel-speed sensors (4x)
- 2 = Relay for charge pump
- 3 = ABS/ASR controller
- 4 = Indicator lamps

- 5 = Overvoltage-protection relay
- 6 = Charge pump and pressure accumulator
- 7 = Hydraulic modulators

INSTALLATION POSITION OF COMPONENTS



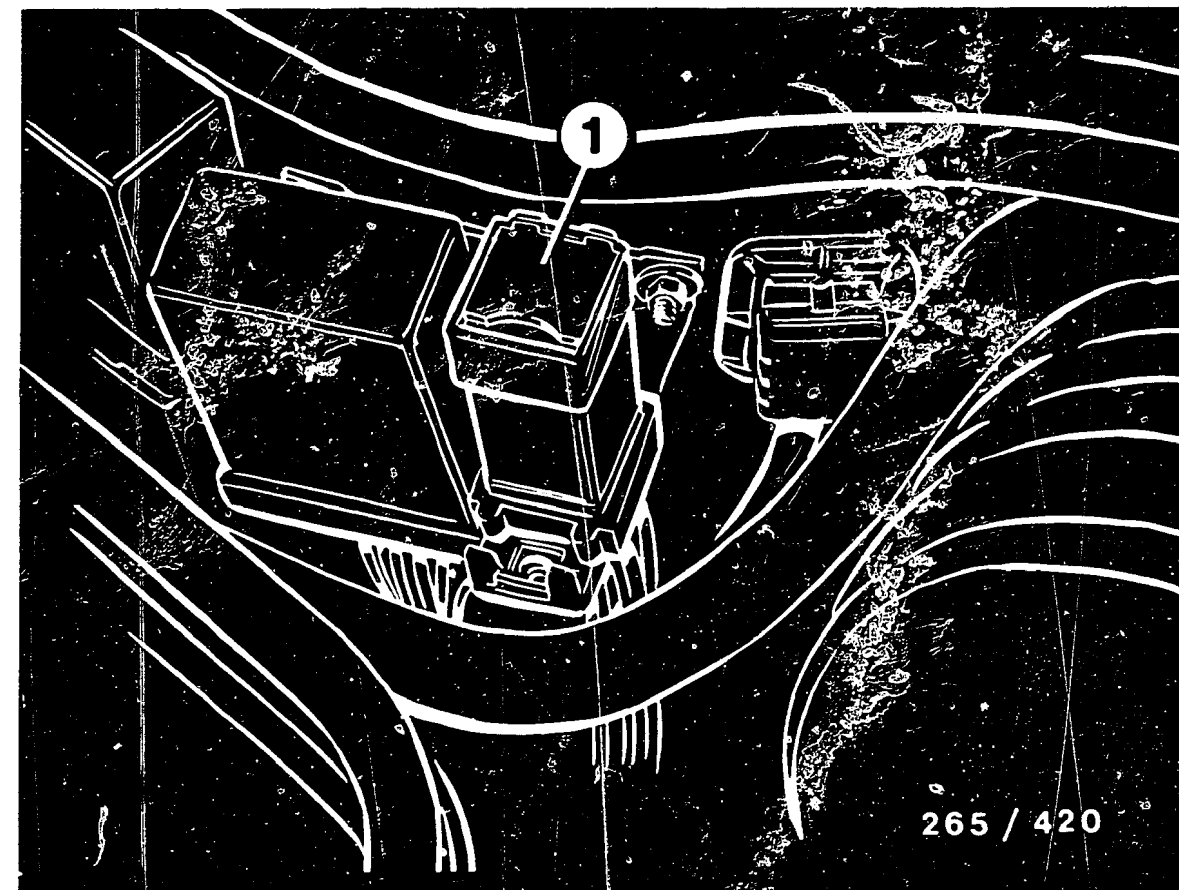
Arrow = ABS/ASR controller

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

ABS/ASR controller (arrow):
beneath the hood in the middle of the engine
compartment.

Disconnect plug:
loosen latch and unhook plug from the mechanical
encoder on the wiring-harness side.

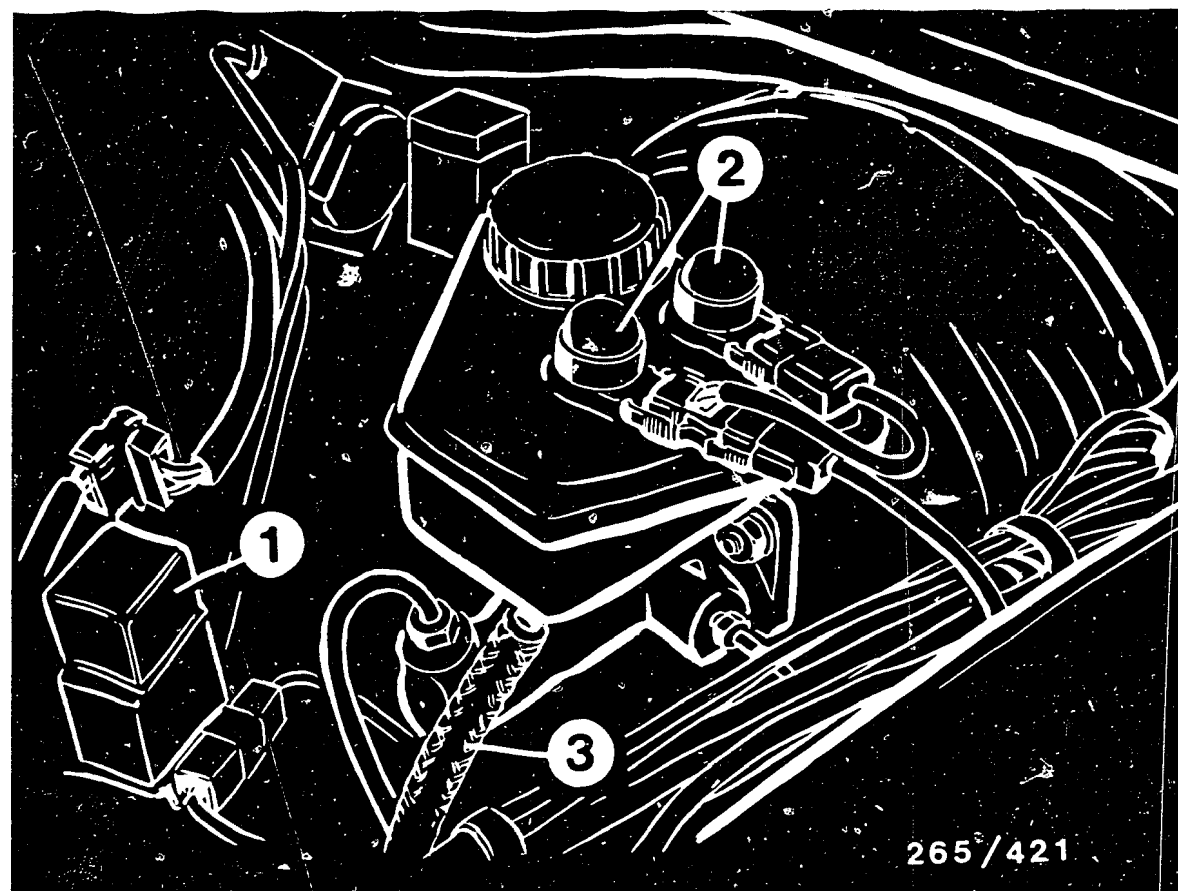
Ground terminals:
behind the instrument cluster,
in the front left wheel house
and on the battery.



1 = Overvoltage-protection relay

INSTALLATION POSITION OF COMPONENTS (Continued)

Overvoltage-protection relay:
in the engine compartment on the left-hand side..

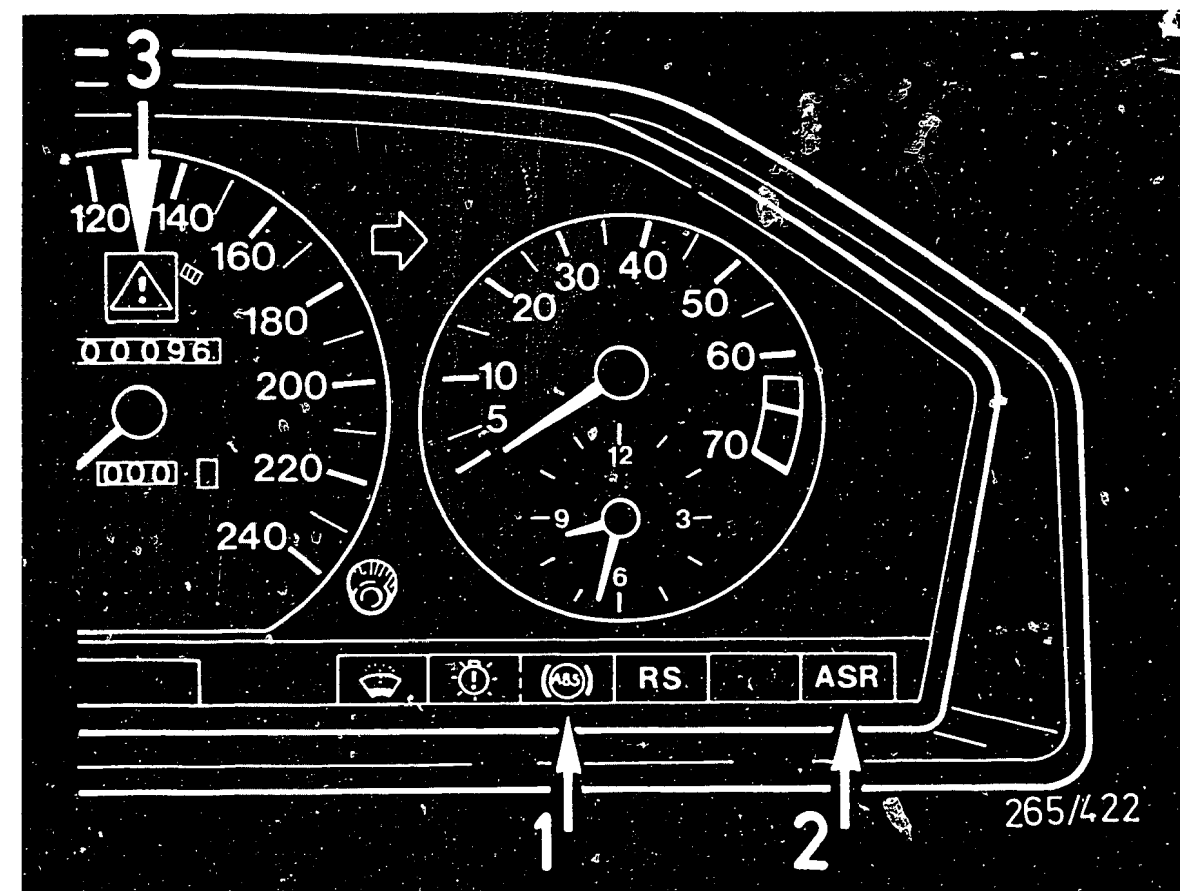


- 1 = Relay for charge pump
- 2 = Switch for brake-fluid check
- 3 = Brake-fluid hose to charge pump

INSTALLATION POSITION OF COMPONENTS (Continued)

Relay for charge pump:

In the engine compartment on the left-hand side of the firewall next to the brake-fluid reservoir.



- 1 = ABS warning lamp
- 2 = ASR warning lamp
- 3 = ASR function indicator

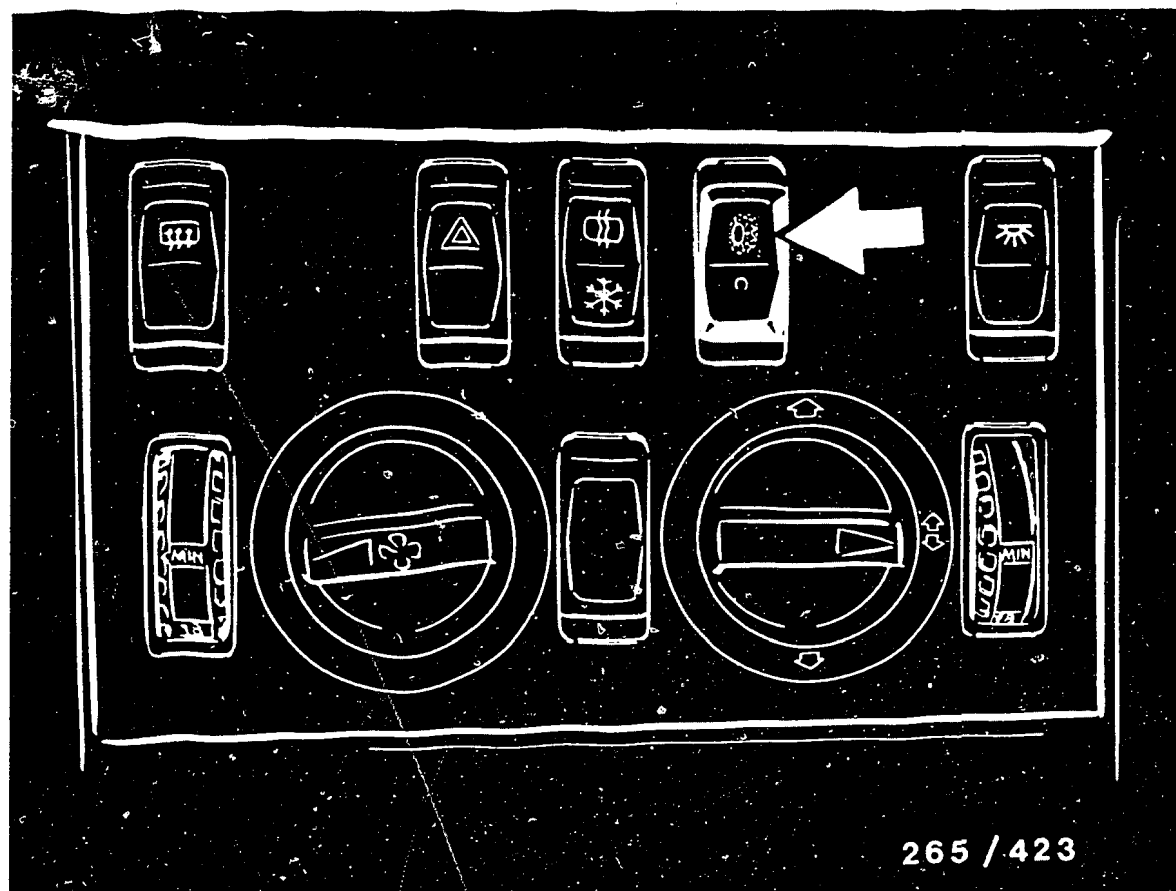
INSTALLATION POSITION OF COMPONENTS (Continued)

ABS and ASR warning lamps:

In the instrument cluster at the bottom right.

ASR function indicator:

In the speedometer at the top (warning triangle).

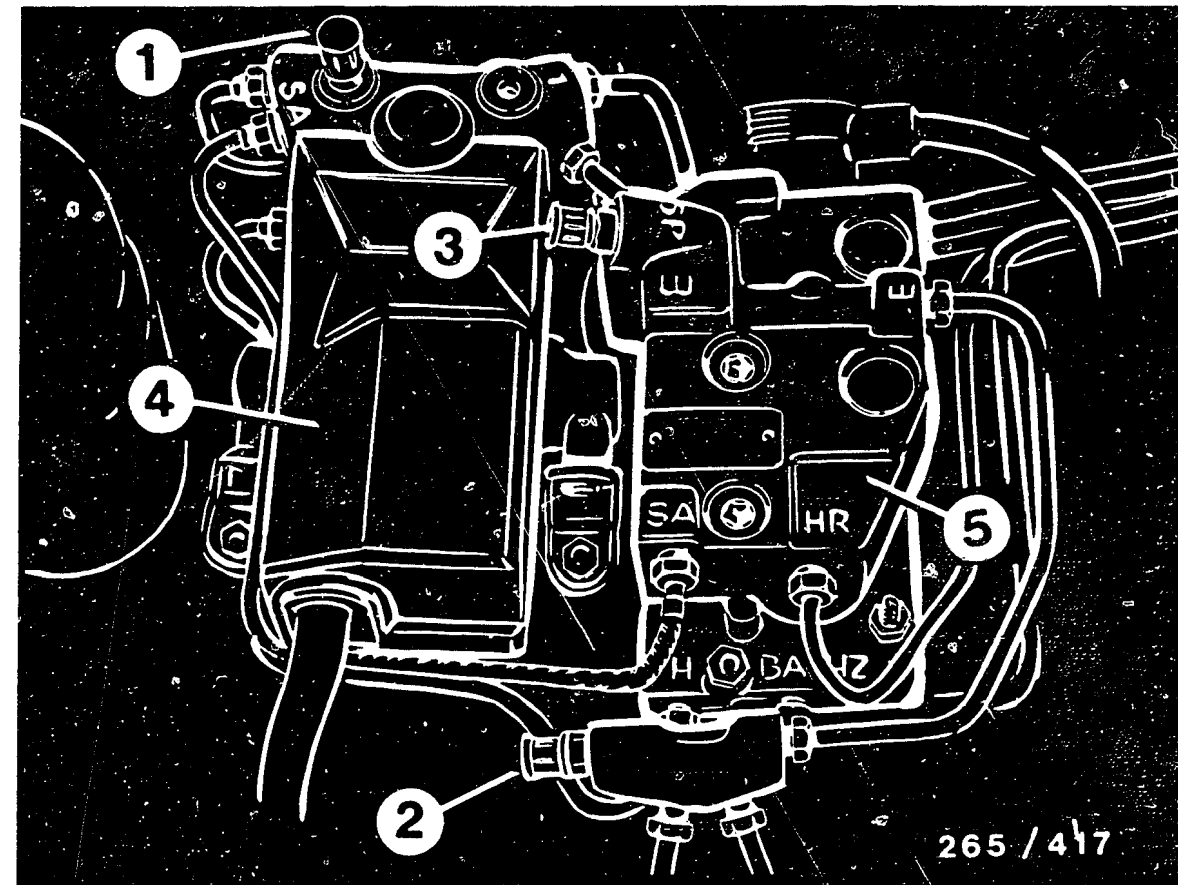


265 / 423

Arrow = Snow-chains switch

INSTALLATION POSITION OF COMPONENTS (Continued)

Snow-chains switch with indicator light:
in the center console.



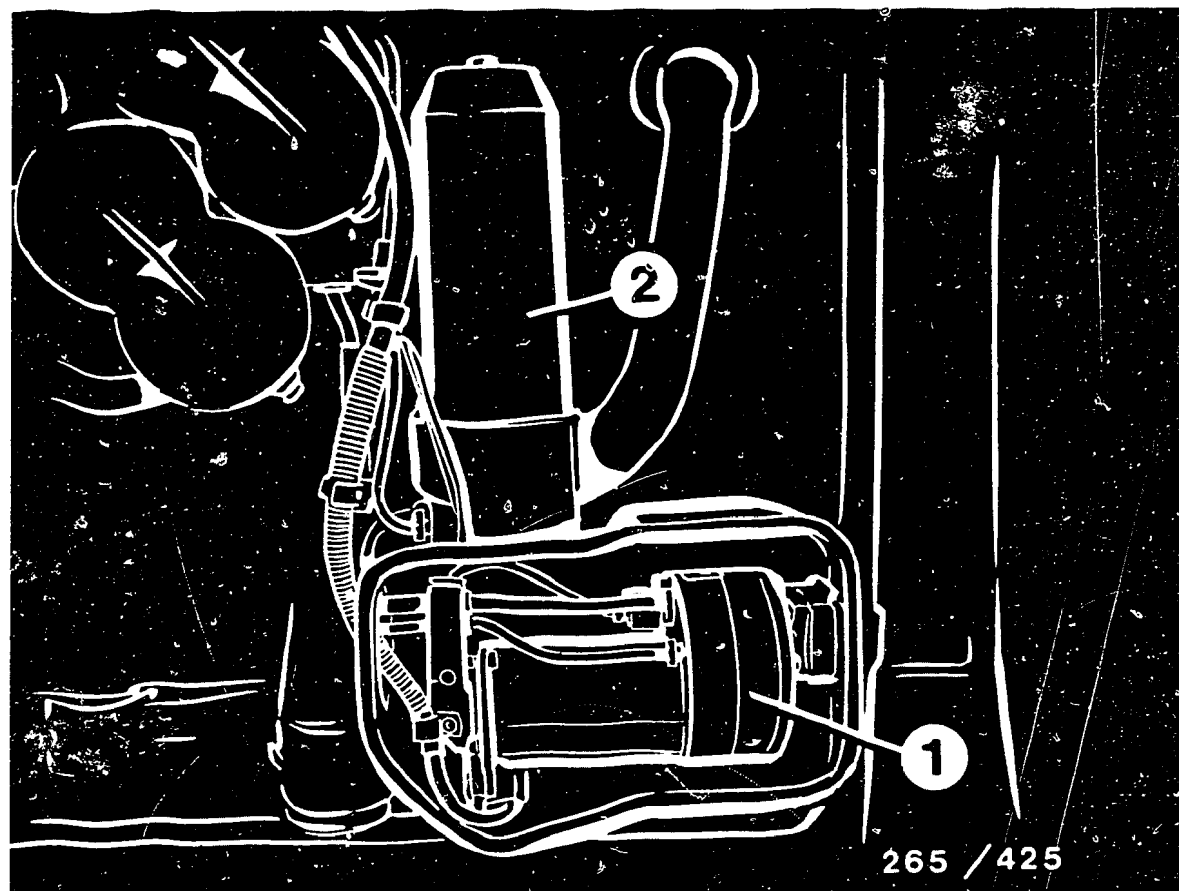
265 / 417

- 1 = Bleeder screw 1
- 2 = Bleeder screw 2
- 3 = Bleeder screw SP3
- 4 = ABS hydraulic modulator
- 5 = ASR hydraulic modulator

INSTALLATION POSITION OF COMPONENTS (Continued)

ABS and ASR hydraulic modulators:
In the engine compartment at the front on the
left-hand side.
Hydraulic modulators must not be repaired, but
be exchanged only as complete units.
Exception: engine and valve relays.

Observe the bleeding specifications!



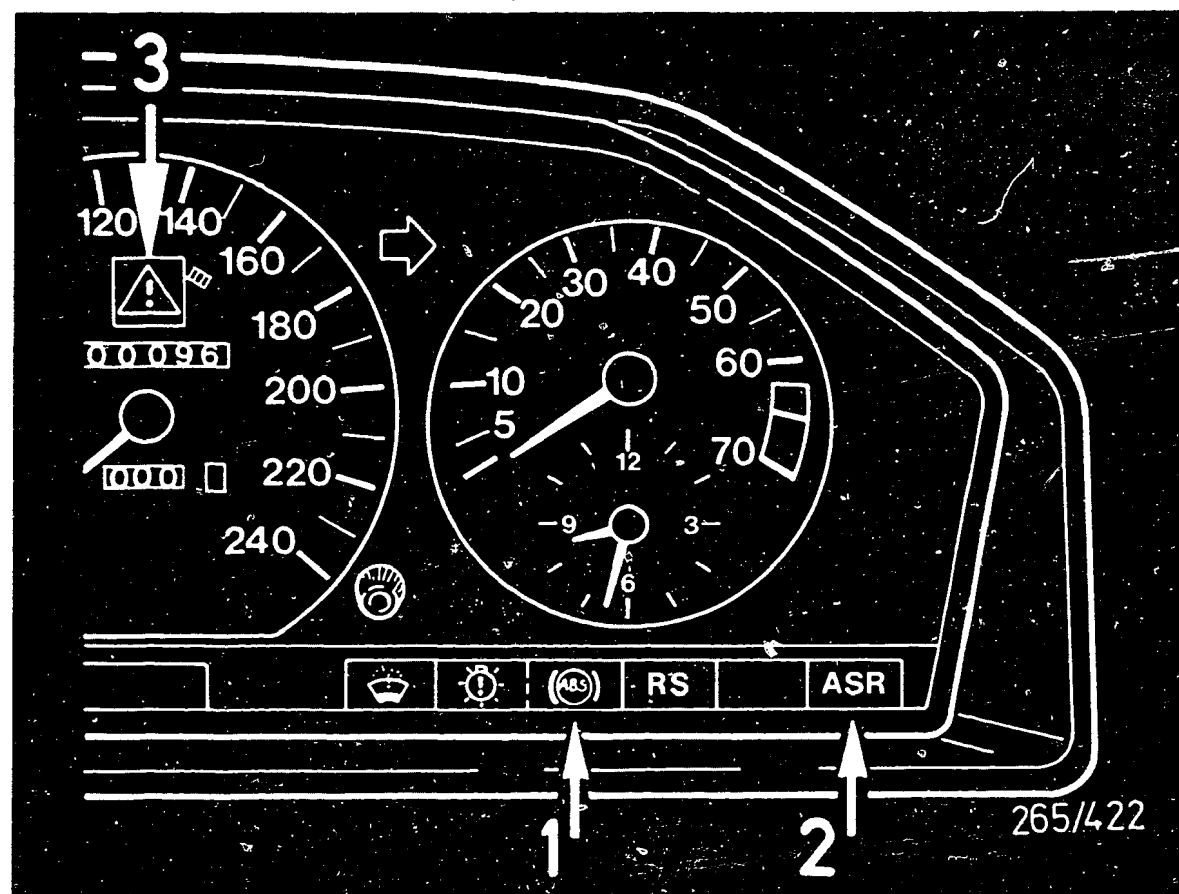
- 1 = Charge pump
2 = Pressure accumulator

INSTALLATION POSITION OF COMPONENTS (Continued)

Charge pump and pressure accumulator:
under the front left fender behind a plastic
covering.

Both components are mounted on a frame. The
frame is secured to the front end of the
vehicle by means of anti-vibration pads.

For production reasons:
continued on the following
coordinate.



- 1 = ABS warning lamp
- 2 = ASR warning lamp
- 3 = ASR function indicator

ABS/ASR INDICATOR LAMPS.

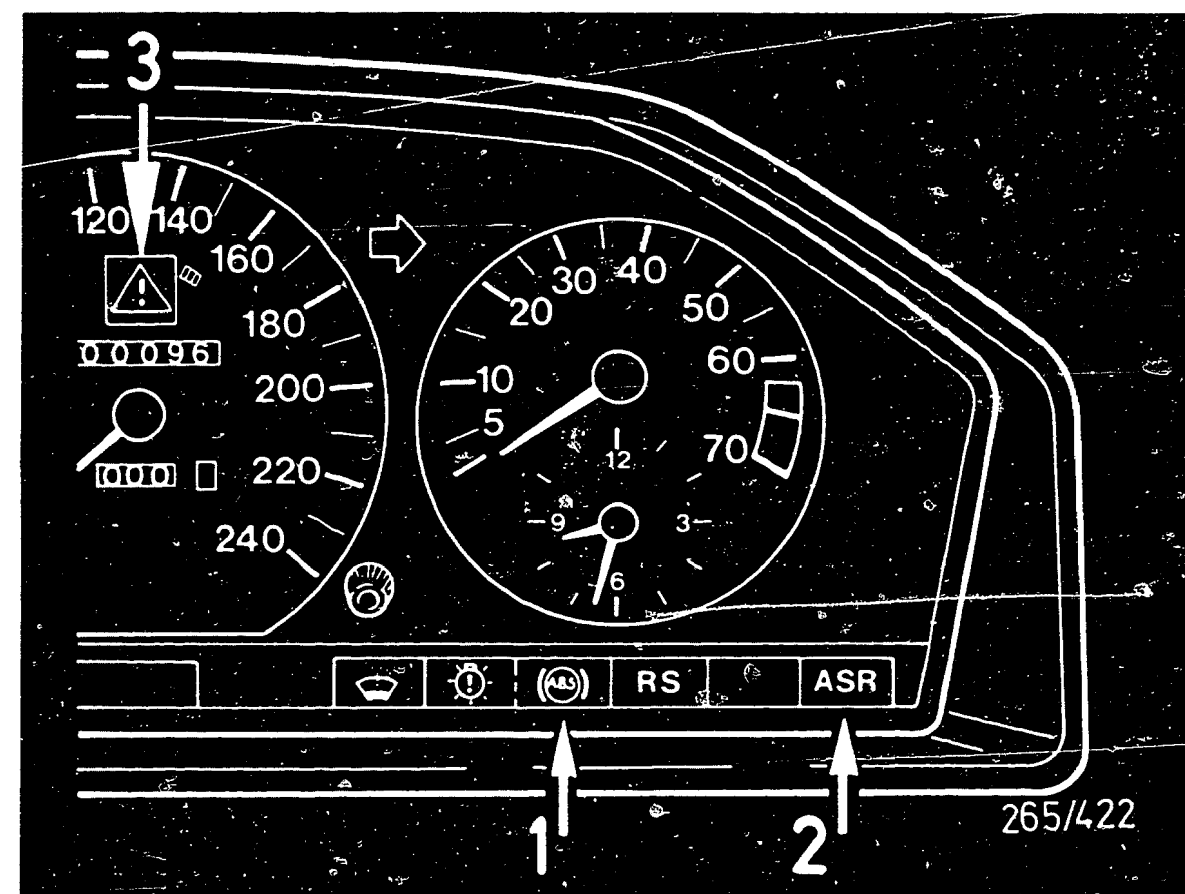
Switch on ignition:

Warning lamps and function indicator in the instrument cluster light up. When the engine is running, all indicators go out.

Vehicle operation:

When ASR operates, the function indicator lights up. When ASR control ends, the function indicator remains lit for approx. 1 second. If ASR control is only very brief, the function indicator does not light up.

The function indicator informs the driver that the ASR is operative and that the vehicle is in the range of its physical limits. In this way, it is possible for the driver to adapt his style of driving more to the road conditions prevailing.

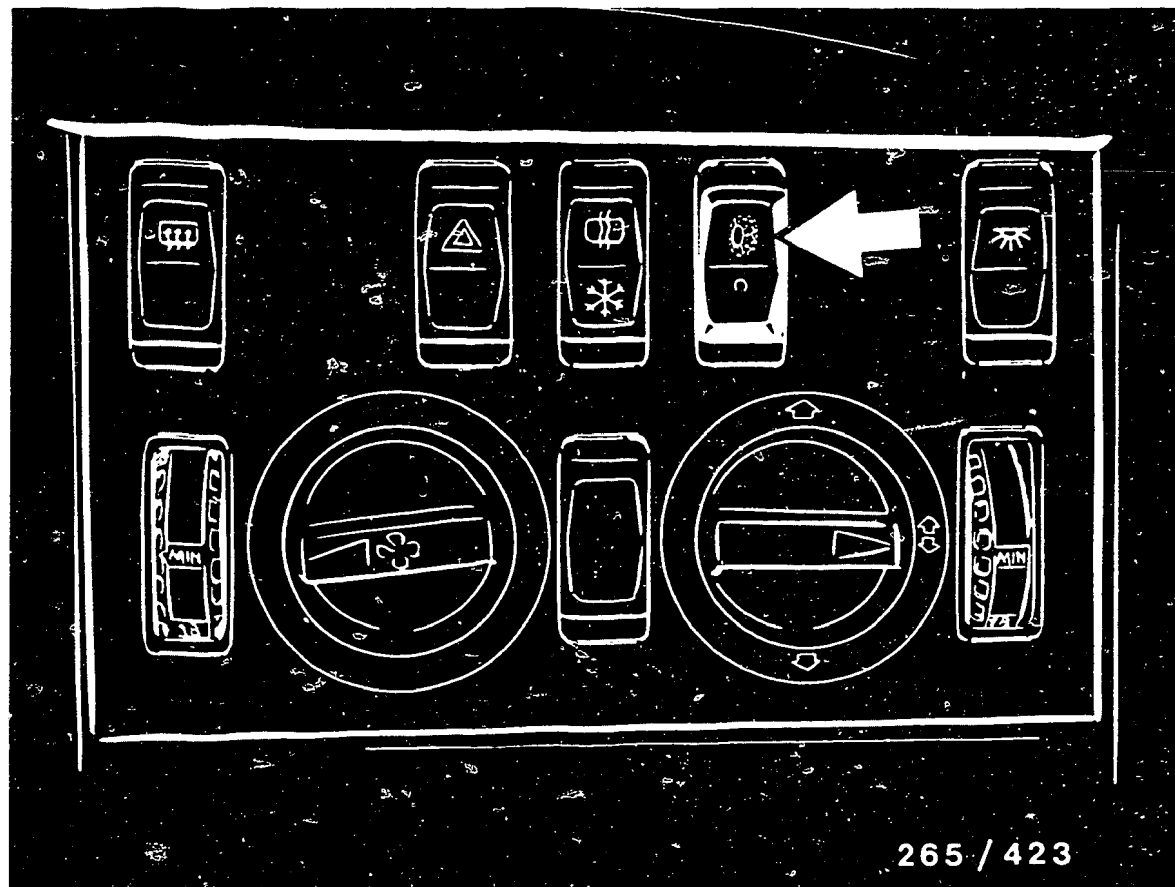


- 1 = ABS warning lamp
- 2 = ASR warning lamp
- 3 = ASR function indicator

Warning lamps:

If the ASR warning lamp lights up when the engine is running, there is a fault in the ASR or in the E Gas. The ASR is not operative, but the ABS continues to be operative. If there is a fault in the E Gas, it is possible to continue driving with reduced engine power output. The driver notices this through the different forces required for actuating the accelerator pedal.

If both warning lamps for ASR and ABS light up, there is a fault in the ASR or in the ABS. If there is a fault in the ABS, the ASR is always switched off together with the ABS. If there is a fault in the ASR and this fault influences the operation of the ABS, the ABS is also switched off.



Arrow = Snow-chains switch

SNOW-CHAINS SWITCH

In order to achieve better traction when driving off in deep snow and with snow chains fitted, the driver can select a special ASR control logic by actuating the snow-chains switch. When the switch is actuated, the indicator lamp in the switch lights up.

Operation:

After approx. 2.5 seconds of constant ASR control, the control automatically switches over to greater drive slip at the wheels. In this way, the driving wheels can gain better traction in the deep snow and thus increase propulsion.

As the speed increases, this higher slip has a disadvantageous effect on the directional stability of the vehicle. For this reason, the slip threshold is reduced again at speeds exceeding 38 km/h. As of 60 km/h, the controller clears the preselected higher slip threshold.

TEST PROCEDURE

A special adapter lead is required for testing. First of all, when the ASR warning lamp lights up, test whether the cause of trouble is to be found in the E Gas control unit (Coordinate B07).

Afterwards, the ASR part is tested using the universal test adapter. To do this, the adapter lead with the 63-pin plug-in connection must be connected to the universal test adapter.

The ASR and the accumulator-charge control are tested dynamically.

The ABS part is then tested with the ABS LED tester, even if the ABS warning lamp does not light up. For this purpose, the adapter lead with the 37-pin terminal must be connected to the ABS tester.

Both testers can be connected at the same time.

If no fault is detected, continue by testing the E Gas system.

TEST REQUIREMENTS

*ABS/ASR is a system for vehicle safety. Working on this system requires detailed knowledge of the system.

*Regulatory tire size fitted?

*To make sure of good handling characteristics, use only tires of the same make and tread pattern. Pay attention to the information given in the owner's manual.

*Check for leaks at the hydraulic modulators and brake-line connections on the hydraulic modulators (visual examination).
It is possible that a slight amount of brake fluid may escape from the bottom of the ABS hydraulic modulator at the ventilation bore of the pump piston. A complaint is only then justified if a puddle of brake fluid forms beneath the hydraulic modulator when the brake pedal is actuated several times.



Opening in the left-hand front fender for pressure-supply unit.

TEST REQUIREMENTS (Continued)

*Check the pressure accumulator, charge pump, and leads (visual examination) through the opening (remove plastic covering) beneath the left-hand front fender.

Customer complaint:

ASR warning lamp lights up.

Test sequence:

+Switch off ignition.
+ABS/ASR controller connected.
+Disconnect E Gas (accelerator-pedal sensor) control unit.
+Bridge term. 31 and term. 34 at E Gas plug.

+Switch on ignition:

1. ASR warning lamp no longer lights up:
+E Gas control unit defective.

2. ASR warning lamp continues to light up:

+Leads to E Gas control-unit plug
term. 31 and term. 34. Test using test adapter
Test step 1.
+Conduct full test using ABS2 LED tester and
universal test adapter.
+If no fault can be detected; exchange ABS/ASR
controller.

Note:

During the ABS test, only one ground LED lights up
when the program-selector switch is in position 1,
since the ground terminal 10 is not fitted with ABS/ASR.

HOW TO USE TEST CHART FOR UNIVERSAL TEST ADAPTER

- * Before testing, check all multiple plug-in connections for loose contacts.
- * Clean soiled or corroded plug contacts.
- * Look out for receptacles which are pushed back. If necessary, bend back locking lug and press receptacle into plug housing to the stop; locking lug latches home.
- * Suspicion of cable break (positive or negative conductor) at kinked or pinched points.

Connect adapter lead.

The peripherals are tested, and, if provision is made, also the control unit.

A multimeter for the measurement of voltage and resistance and/or a motortester is to be connected to the universal test adapter for the detection of measured values.

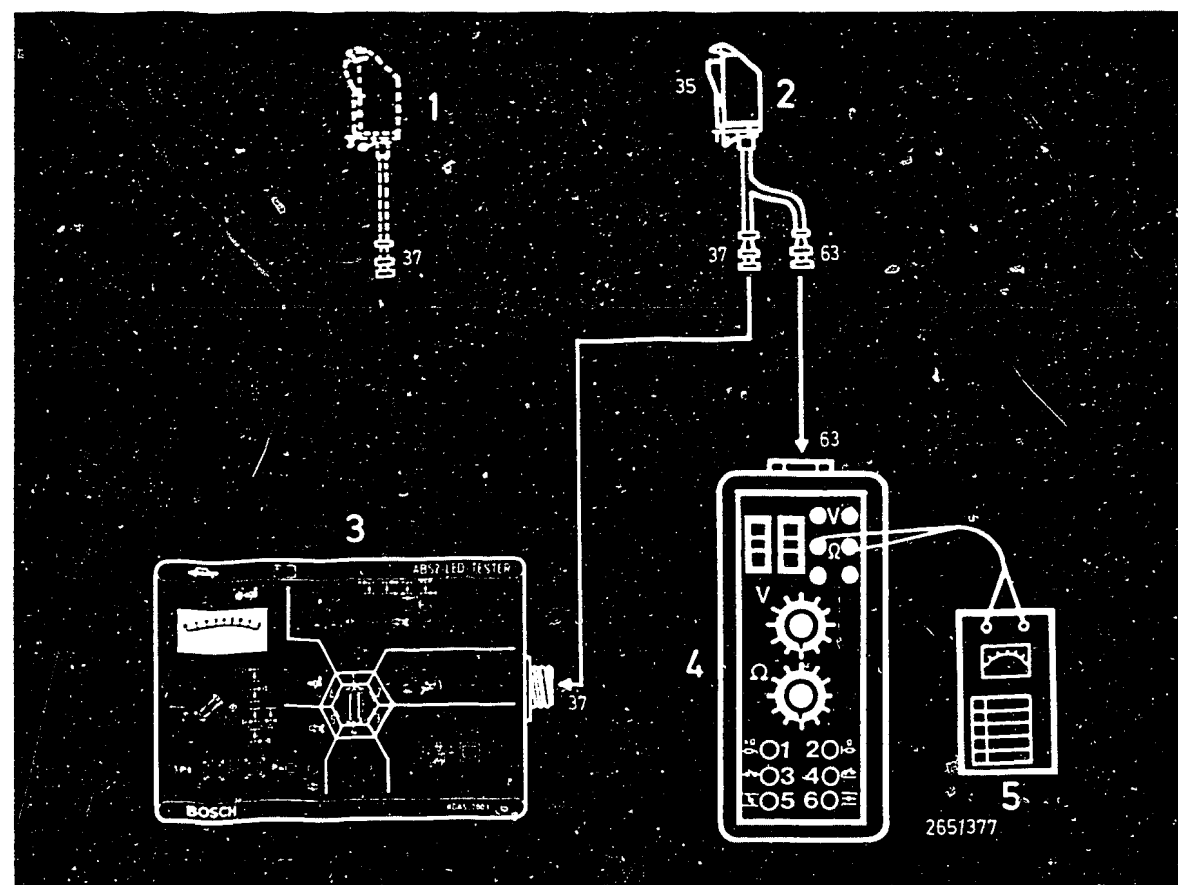
The test must always be carried out in full, starting at test step 1, in the specified sequence.

TEST SEQUENCE:

1. The individual test steps follow on from each other.
Example: if in one test step the ground connection for the control unit is tested, this test is not repeated again in the further test steps.
2. If the set value is not obtained in a test step, after rectification of the fault the test step must be repeated.

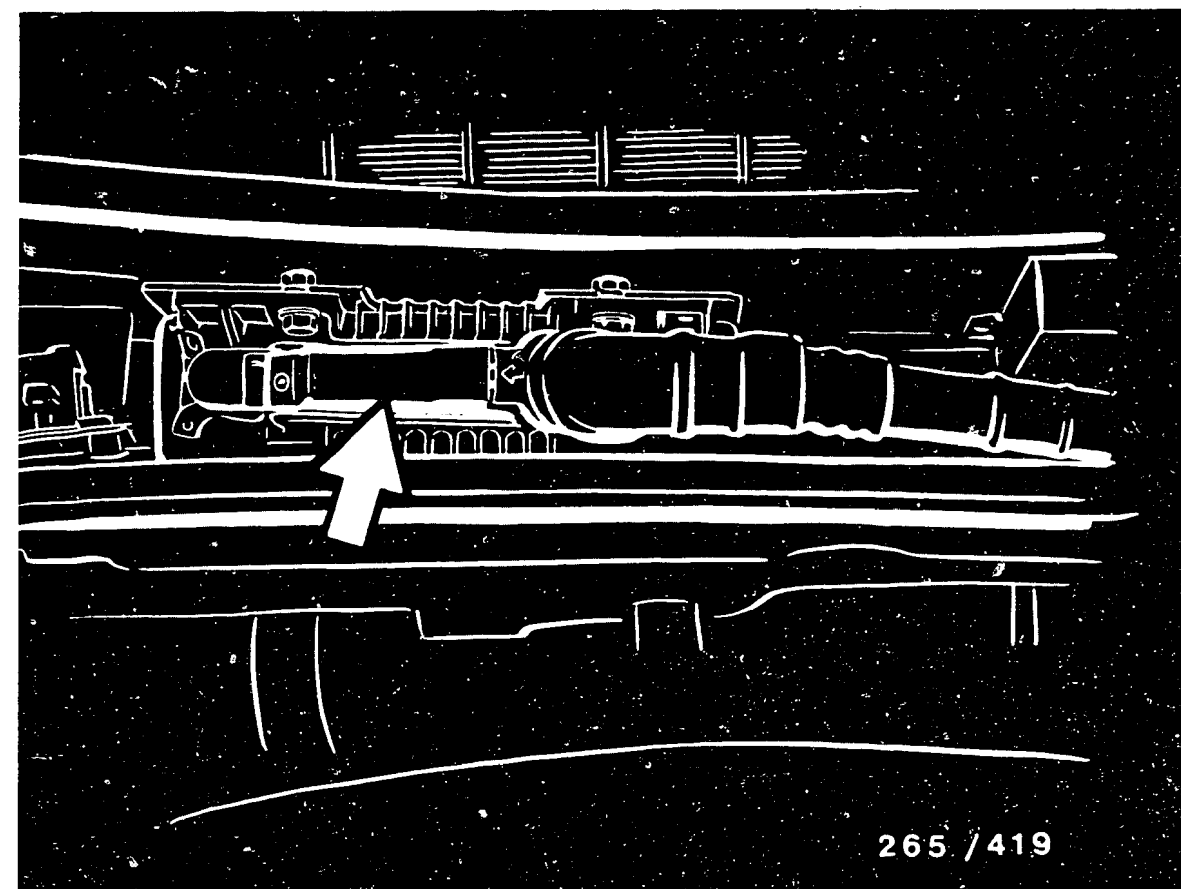
Note:

In the following test steps, the additionally boxed-in sections of the text indicate which operation is to be changed in comparison with the preceding test step.



- 1 = Adapter lead for ABS 2 LED tester, 35-pin (is not required)
- 2 = Adapter lead for ABS/ASR, 35-pin
- 3 = ABS 2 LED tester (tests ABS 2 part)
- 4 = Universal test adapter (tests ASR part)
- 5 = Multimeter

* Connect universal test adapter to ABS/ASR wiring harness.
Controller is located in the engine compartment in the middle.



Arrow = ABS/ASR controller

- * Remove plug:
loosen latch and unhook plug from mechanical encoder on the wiring-harness side.

CAUTION!

- * Disconnect or connect the controller only when the ignition is switched off.
- * Do not drive the vehicle with the tester connected!

After any repair work, the entire test program must be repeated.

General information on trouble-shooting:

Check all leads for short circuit to ground and contact with positive leads, as well as for worn insulation and pinched locations.

Component/function:

Leads to E Gas control unit.

N>

* Operation: Position:

Prog.-selec. switch " V "	==>
Prog.-selec. switch " Ω "	3
Test button	—

* Measuring equipment:

Motortester or multimeter

* Measuring range:

x 10 Ω

* Connection:

Measuring sockets, blue Ω

* Operation in vehicle:

Ignition off.
Disconnect E Gas control unit
and using suitable lead,
bridge the terminals 31 and
34 at the plug.

* Set value:

0...10 Ω

Is measured value within
set-value tolerance?

* Trouble-shooting:

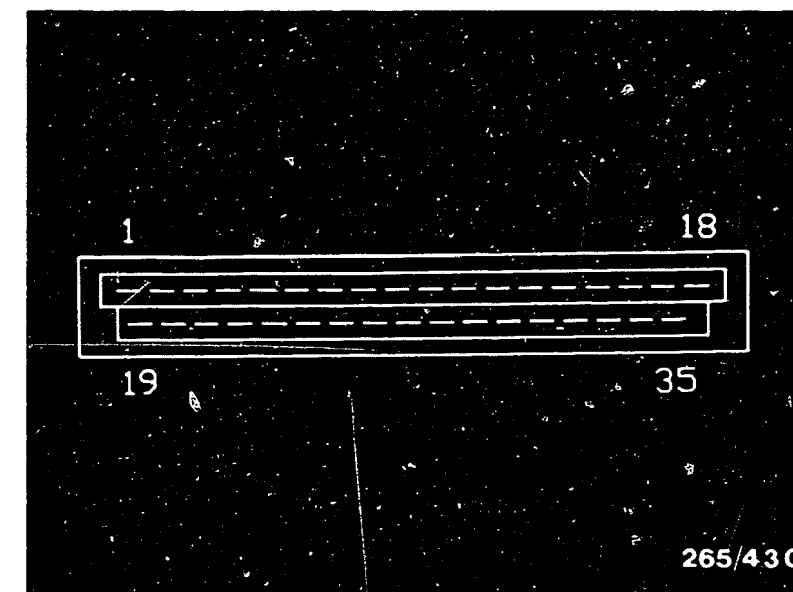
For testing, disconnect
controller plug from test
adapter.

Test following leads with
ohmmeter for continuity,
set value: 0 Ω

* From E Gas control-unit
plug term.31 to Motronic
control-unit plug term.13.

* From E Gas control-unit
plug term.34 to Motronic
control-unit plug term.16.

* Eliminate open circuits/
contact resistances.



Top view of 35-pin control-unit plug

Continued on next picture page

Component/function:
Coil resistance of motor relay
for charge pump.

N>

* Operation:

	Position:
Prog.-selec. switch " V "	==>
Prog.-selec. switch " Ω "	9
Test button	—

* Measuring equipment:
Motortester or multimeter

* Measuring range:
x 10 Ω

* Connection:
Measuring sockets, blue Ω

* Operation in vehicle:
Ignition off

* Set value:
40...65 Ω

Is measured value within
set-value tolerance?

* Trouble-shooting:
For testing, disconnect
controller plug from test
adapter.

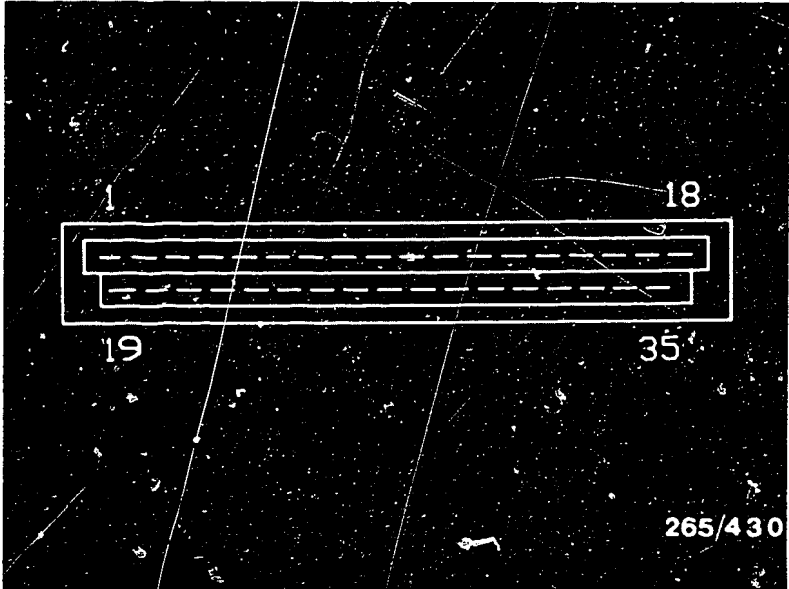
Test following leads with
ohmmeter for continuity,
set value: 0 Ω

* From motor relay K4/term. 85
to Motronic control-unit
plug term.33.

* From motor relay K4/term.86
to Motronic control-unit
plug term.22.

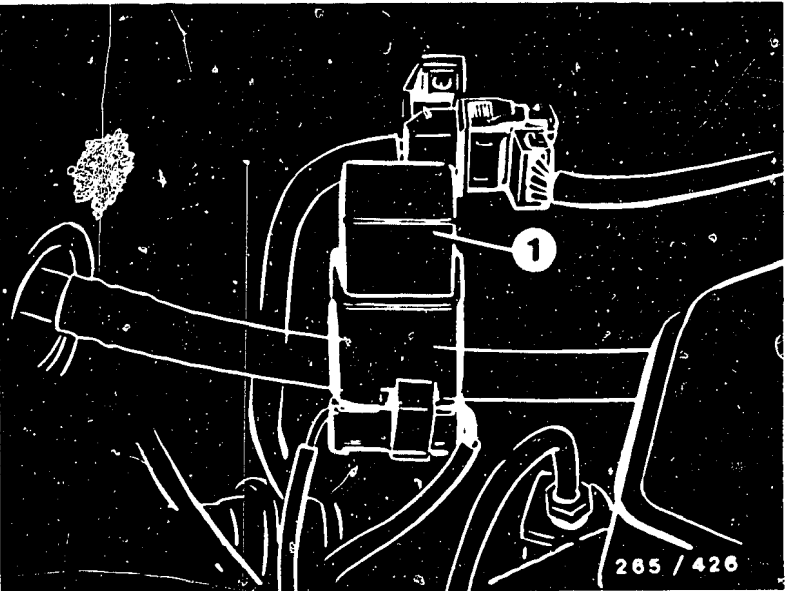
Eliminate open circuits/
contact resistances.

* Motor relay K4 defective:
exchange.



Top view of 35-pin control-unit plug

1 = Relay for charge pump



↓

Component/function:
Coil resistance of change-over valve.

* Operation:

	Position:
Prog.-selec. switch " V "	==>
Prog.-selec. switch " Ω "	16
Test button	—

* Measuring equipment:

Motor tester or multimeter

* Measuring range:

x 10 Ω

* Connection:

Measuring sockets, blue: Ω

* Operation in vehicle:

Ignition off

* Set value:

5...8 Ω

Is measured value within
set-value tolerance?

N>

* Trouble-shooting:

For testing, disconnect
controller plug from test
adapter.

Test following leads with
ohmmeter for continuity,
set value: 0 Ω

* From ASR hydraulic modulator
term.2 to Motronic
control-unit plug term.30.

* From ASR hydraulic modulator
term.4 to Motronic
control-unit plug term.31.

Eliminate open circuits/
contact resistances.

* Measure coil resistance
of change-over valve directly
at ASR hydraulic modulator
between term. 2 and term. 4.
Set value: 5...8 Ω
If set value is not obtained:
exchange ASR hydraulic
modulator.

A black and white photograph showing the top view of a 35-pin control-unit plug. The plug is a long, rectangular component with two rows of pins. The pins are numbered: 1 and 18 at the top corners, 19 and 35 at the bottom corners. The plug is set against a dark background.

Top view of 35-pin control-unit plug

A black and white photograph showing the top view of a plug at an ASR hydraulic modulator. The plug is a circular component with four terminals labeled 1, 2, 3, and 4. The plug is connected to a larger, more complex component, likely the ASR hydraulic modulator. The background is dark.

Top view of plug at ASR hydraulic modulator

Continued on next picture page

B15

<==>

B16

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Component/function:
Voltage supply for controller

* Operation:

	Position:
Prog.-selec. switch " V "	4
Prog.-selec. switch " Ω "	16
Test button	—

* Measuring equipment:

Motortester or multimeter

* Measuring range:

min. 15 V

* Connection:

Measuring socket, red (+)
Measuring socket, black (-)

* Operation in vehicle:

Ignition off

* Set value:

0 V

* Operation in vehicle:

Ignition on

* Set value:

10,5...15 V

Is measured value within
set-value tolerance?

↓

Continued on next picture page

N>

* Trouble-shooting:
For testing, disconnect
controller plug from test
adapter.

Test following leads with
ohmmeter for continuity,
set value 0 Ω ;

* From controller plug
term. 1 to overvoltage-
protection relay term. 87E .

* From overvoltage-protection
relay term. 15 to driving
switch term. 15.

* From overvoltage-protection
relay term. 30 to
battery term. + .

* From overvoltage-protection
relay term. 31 to vehicle
ground.

Eliminate open circuits/contact
resistances.

* Overvoltage-protection relay
defective: exchange.

A top-down photograph of a 35-pin control unit plug. The plug is a long, rectangular component with a series of pins along its length. Four specific pins are labeled with numbers: '1' at the top left, '18' at the top right, '19' at the bottom left, and '35' at the bottom right. The background is dark and textured.

Top view of 35-pin control-unit plug

1 = Overvoltage-protection relay

A technical line drawing of a vehicle's engine compartment. Various components like the battery, alternator, and other electrical parts are sketched. A circled number '1' with a leader line points to a specific relay located near the battery. The drawing is in a simplified, schematic style.

B17

⏪

B18

⏩

Component/function:

ASR warning lamp

N>

* Operation:

Position:	
Prog.-selec. switch " V "	7
Prog.-selec. switch " Ω "	16
Test button	—

* Measuring equipment:

Motortester or multimeter

* Measuring range:

min. 15 V

* Connection:

Measuring socket, red (+)

Measuring socket, black (-)

* Operation in vehicle:

Ignition on.

Visual examination of ASR warning lamp.

Note: ABS2 LED tester must not be at test step 5.

* Set value:

ASR warning lamp in vehicle lights up.

Does ASR warning lamp light up?

* Trouble-shooting:

* Fuse F1 defective.

For testing, disconnect controller plug from test adapter.

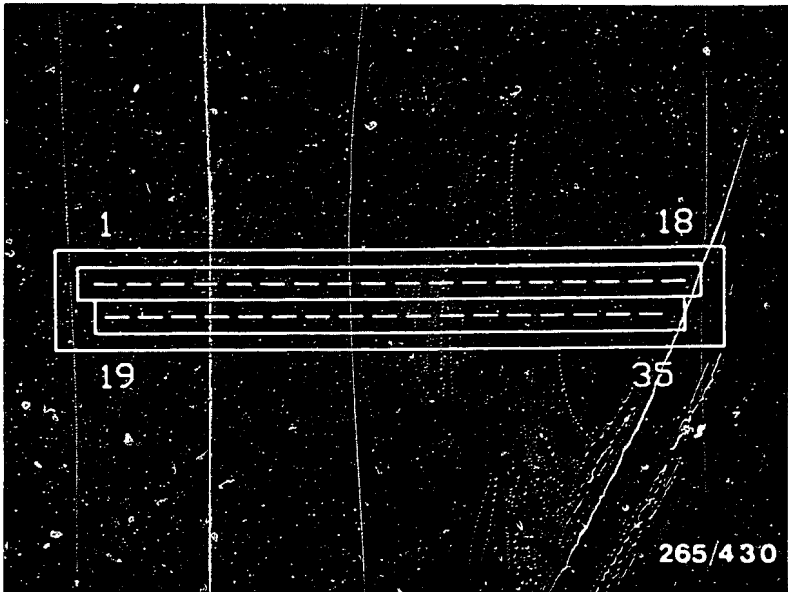
Test following leads with ohmmeter for continuity, set value: 0 Ω

* From controller plug term.17 to ASR warning lamp.

* From ASR warning lamp to fuse F1.

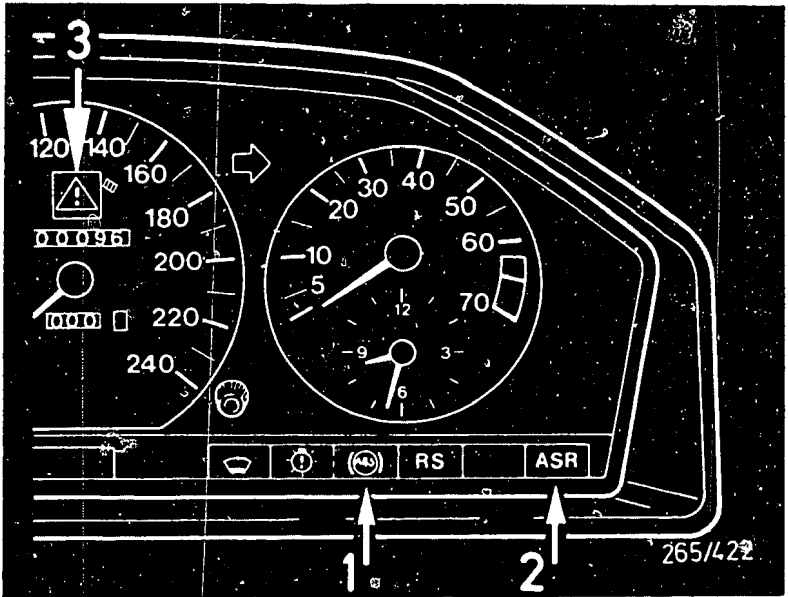
Eliminate open circuits/contact resistances.

* ASR warning lamp defective: exchange.



Top view of 35-pin control-unit plug

- 1 = ABS warning lamp
- 2 = ASR warning lamp
- 3 = ASR function indicator



Continued on next picture page

Component/function:

Valve relay (diode, break contact) and resistor in pin base.

N>

* Operation:	Position:
Prog.-selec. switch " V "	7
Prog.-selec. switch " Ω "	16
Test button	—

* Measuring equipment:
Motortester or multimeter

* Measuring range:
min. 15 V

* Connection:
Measuring socket, red (+)
Measuring socket, black (-)

* Operation in vehicle:
Ignition on.

* Set value:
0,5...1,5 V

Is measured value within
set-value tolerance?

* Trouble-shooting:

For testing, disconnect
control plug from test
adapter.

Test following leads with
ohmmeter for continuity,
set value: 0 Ω

* From controller plug
term.17 to ABS hydraulic
modulator term.8.

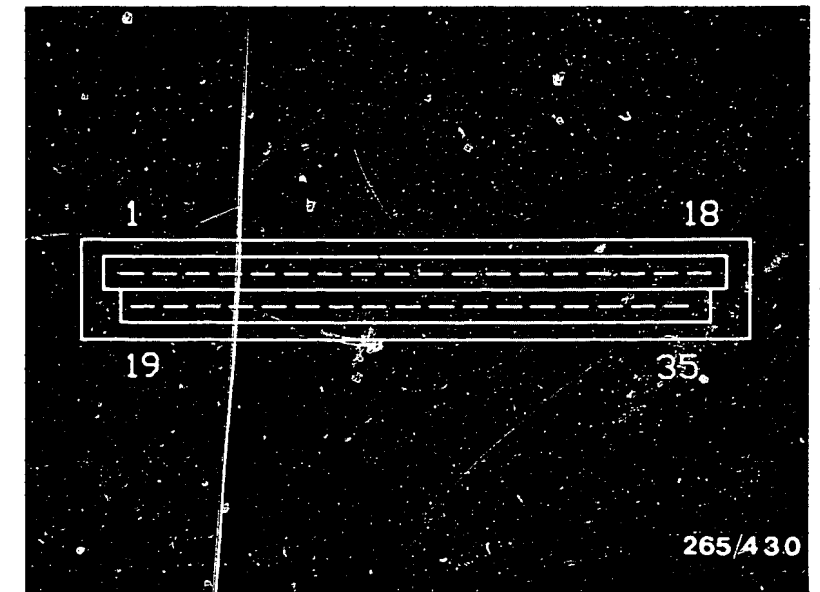
* From ABS hydraulic modulator
term.8 to valve relay term.L2.

Eliminate open circuits/
contact resistances.

* Measure resistance in pin
base between valve relay
term.87a and hydraulic-
modulator frame connection.
Set value: 1,9...2,5 Ω .

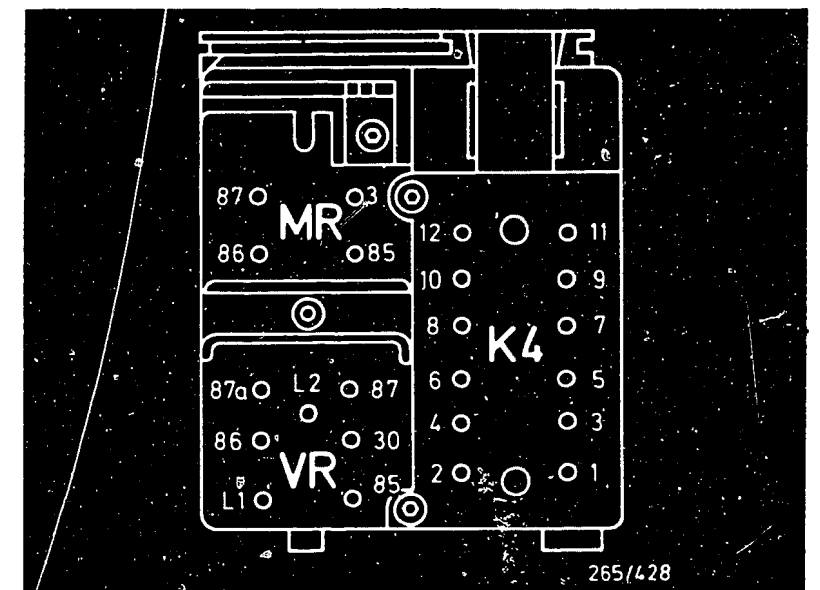
Lead or resistor in pin base
defective.
Exchange ABS hydraulic modulator.

* Valve relay defective:
exchange.



Top view of 35-pin control-
unit plug

Top view of pluggable printed-board
assembly of the ABS hydraulic
modulator: MR = Motor relay
VR = Valve relay
K4 = Hydraulic-modulator plug



Continued on next picture page

Component/function:

ASR function indicator

N>

* Operation:	Position:
Prog.-selec. switch " V "	7
Prog.-selec. switch " Ω "	16
Test button	3

* Measuring equipment:
Motortester or multimeter

* Measuring range:
min. 15 V

* Connection:
Measuring socket, red (+)
Measuring socket, black (-)

* Operation in vehicle:
Ignition on.
Actuate push-button 3.
Visual examination of
ASR function indicator.

* Set value:
ASR function indicator in
instrument cluster lights
up.

Does ASR function indicator
light up?

* Trouble-shooting:

* Fuse F1 defective.

For testing, disconnect
controller plug from test
adapter.

Test following leads with
ohmmeter for continuity,
set value: 0 Ω

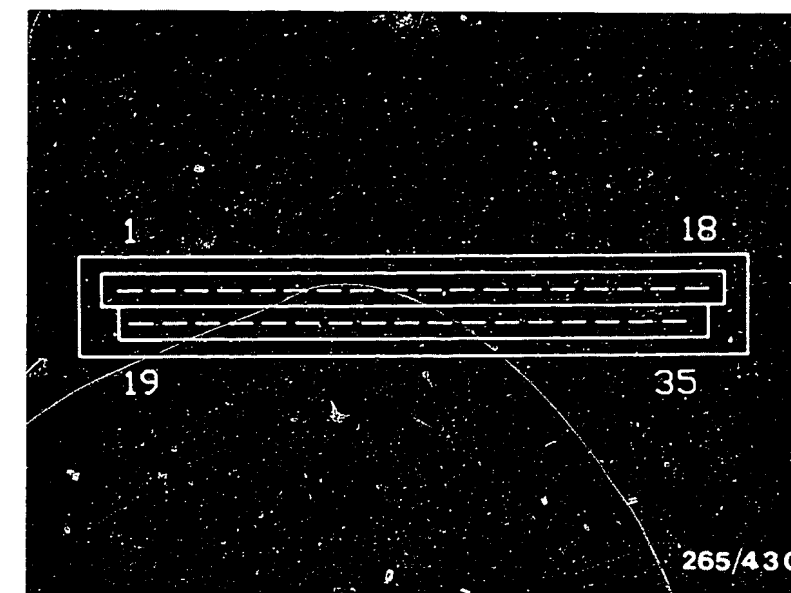
* From snow-chains switch
term.4 to fuse F1.

* From controller plug
term.10 to ASR function
indicator in instrument
cluster term.1.

* From ASR function indicator
term.2 to snow-chains
switch term.4.

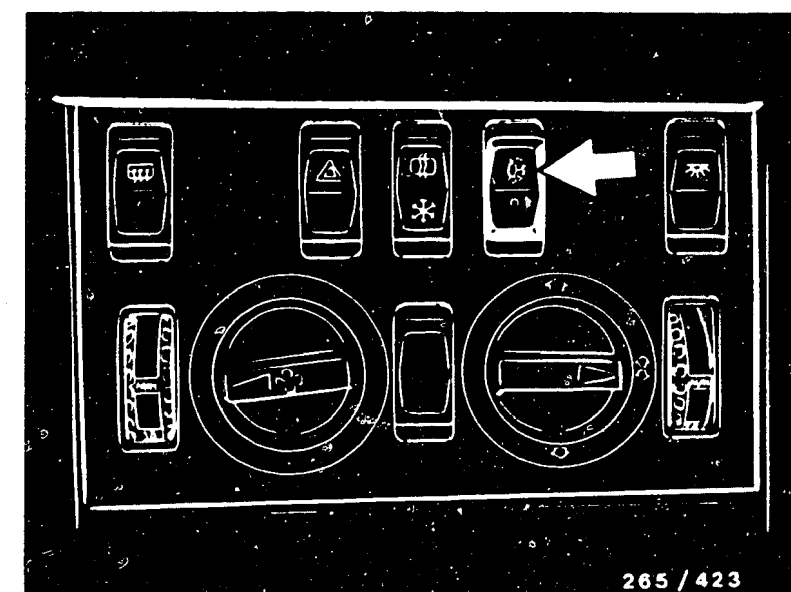
Eliminate open circuits/
contact resistances.

* ASR function indicator defective:
exchange lamp,
repair function indicator.



Top view of 35-pin control-
unit plug

Arrow = Snow-chains switch



Continued on next picture page

V

Component/function:
Indicator lamp for
snow-chains switch

N>

* Operation:

	Position:
Prog.-selec. switch " V "	7
Prog.-selec. switch Ω "	16
Test button	2

* Measuring equipment:

Motortester or multimeter

* Measuring range:

min. 15 V

* Connection:

Measuring socket, red (+)
Measuring socket, black (-)

* Operation in vehicle:

Ignition on.
Actuate push-button 2.
Visual examination of
indicator lamp.

* Set value:

Indicator lamp for snow-
chains switch lights up.

Does indicator lamp light
up?

Y

V

Continued on next picture page

* Trouble-shooting:

For testing, disconnect
controller plug from test
adapter.

Test following leads with
ohmmeter for continuity,
set value: 0 Ω

* From controller plug
term.3 to snow-chains
switch term.6.

Eliminate open circuits/
contact resistances.

* Indicator lamp for snow-
chains switch defective:
exchange snow-chains switch.

A black and white photograph showing the top view of a 35-pin control unit plug. The plug is rectangular with a series of pins along its edges. Four specific pins are labeled with numbers: 1 at the top left, 18 at the top right, 19 at the bottom left, and 35 at the bottom right. The background is dark and textured.

Top view of 35-pin control-unit plug

Arrow = Snow-chains switch

A black and white photograph of a control panel. It features several rectangular buttons with different symbols: a car with a snowflake, a car with a triangle, a car with a circle, and a car with a star. There are also two circular gauges or indicators. A white arrow points to one of the buttons, indicating it is the snow-chains switch. The panel is mounted on a dark background.

B25

<=>

B26

<=>

Component/function:
Snow-chains switch

N>

* Operation:

	Position:
Prog.-selec. switch " V "	8
Prog.-selec. switch " Ω "	16
Test button	2

* Measuring equipment:

Motortester or multimeter

* Measuring range:

min. 15 V

* Connection:

Measuring socket, red (+)
Measuring socket, black (-)

* Operation in vehicle:

Ignition on.
Actuate snow-chains switch.

* Set value:

10,3...15 V

Is measured value within
set-value tolerance?

* Trouble-shooting:

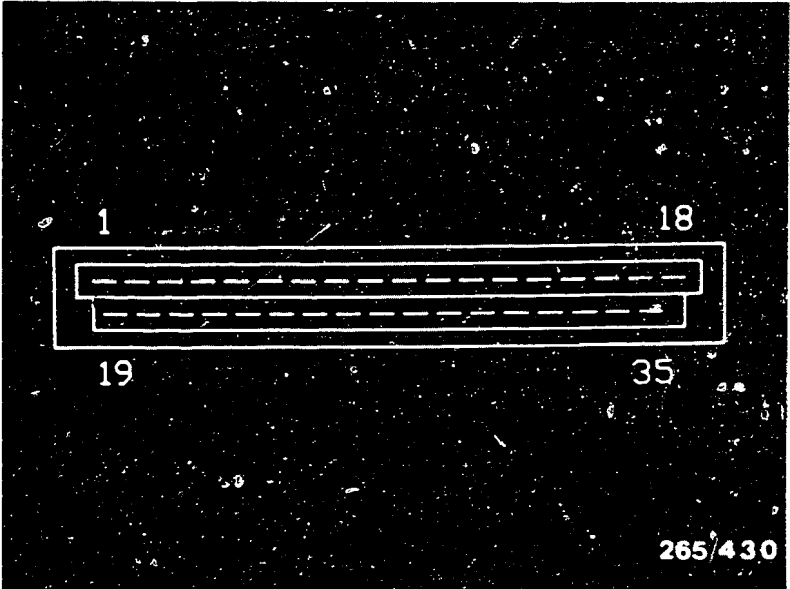
For testing, disconnect
controller plug from test
adapter.

Test following leads with
ohmmeter for continuity,
set value: 0 Ω

* From controller plug
term.5 to snow-chains
switch term.3.

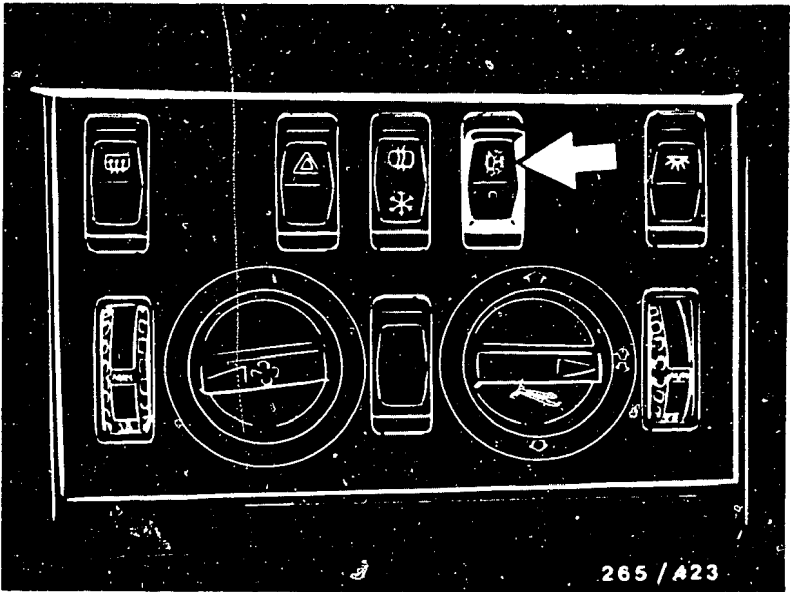
Eliminate open circuits/
contact resistances.

* Snow-chains switch defective:
exchange
snow-chains switch.



Top view of 35-pin control-unit plug

Arrow = Snow-chains switch



Continued on next picture page

Component/function:

Pressure switch in operating pressure position

N>

* Operation:	Position:
Prog.-selec. switch " V "	10
Prog.-selec. switch " Ω "	16
Test button	1

* Measuring range:
Motortester or multimeter

* Measuring range:
min. 15 V

* Connection:
Measuring socket, red (+)
Measuring socket, black (-)

* Operation in vehicle:
Ignition on.
Actuate push-button 1.
(Valve relay picks up).
Note: accumulator pressure must be available so that pressure-switch contact switches to ground. If required, generate charge pressure.

* Set value:
Less than 0,5 V

Is measured value within set-value tolerance?

* Trouble-shooting:

If required, generate charge pressure as follows:
Connect control unit and leave engine running for approx. 1 minute. To make sure that pressure is available, a pressure test must be conducted (see "Test accumulator charging control").

For further testing, disconnect controller plug from test adapter.

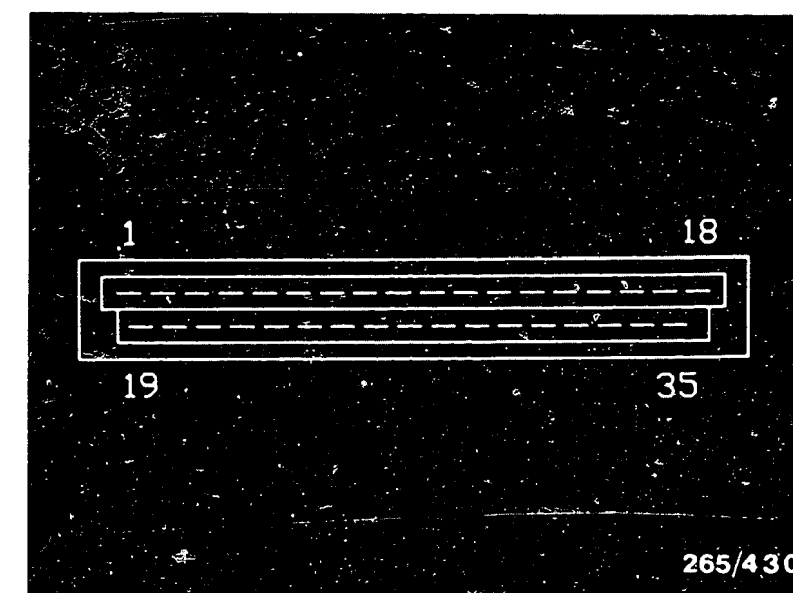
Test following leads with ohmmeter for continuity, set value: 0 Ω

- * From controller plug term.8 to ASR hydraulic modulator term.1.
- * Ground cable from ASR hydraulic modulator.

Eliminate open circuits/contact resistances.

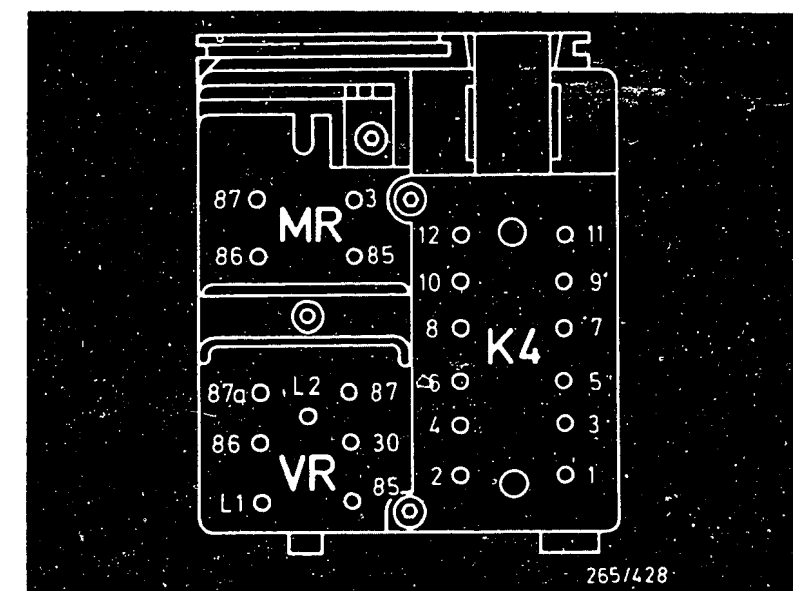
- * Measure resistance directly at ASR hydraulic modulator between term.1 and ground. Set value: 1,4...1,7 k Ω

- * Pressure switch or resistor defective:
Exchange ASR hydraulic modulator.



Top view of 35-pin control-unit plug

Top view of plug at ASR hydraulic modulator



Continued on next picture page

Component/function:

Pressure switch: pressure
less than operating pressure.

N>

* Pressure switch defective:
Exchange ASR hydraulic modulator.

* Operation:	Position:
Prog.-selec. switch " V "	10
Prog.-selec. switch " Ω "	16
Test button	1

* Measuring equipment:
Motortester or multimeter

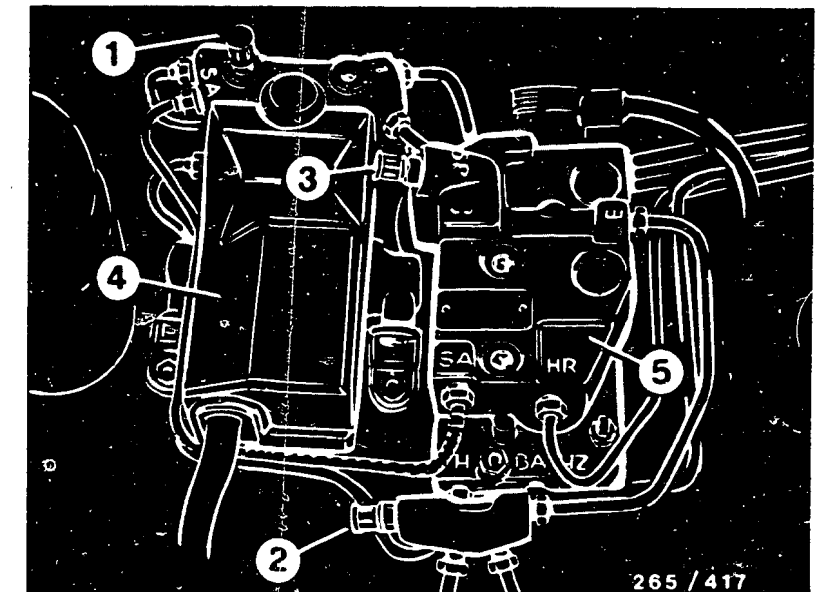
* Measuring range:
min. 15 V

* Connection:
Measuring socket, red (+)
Measuring socket, black (-)

* Operation in vehicle:
Ignition off.
Connect hose to connection SP3 of hydraulic modulator and dangle into container. Build up accumulator pressure by opening the connection SP3.
Ignition on. Actuate push-button 1.

* Set value:
10,3...15 V

Is measured value within
set-value tolerance?



- 1 = Bleeder screw 1
- 2 = Bleeder screw 2
- 3 = Bleeder screw SP3
- 4 = ABS hydraulic modulator
- 5 = ETC hydraulic modulator

Continued on next picture page

Component/function:
Resistor in ASR hydraulic modulator.

N>

* Operation:

	Position:
Prog.-selec. switch " V "	10
Prog.-selec. switch " Ω "	16
Test button	—

* Measuring equipment:

Motortester or multimeter

* Measuring range:

x 10 Ω

* Connection:

Measuring socket, red (+)
Measuring socket, black (-)
Note: resistance is measured at the voltage sockets.

* Operation in vehicle:

Ignition off.

* Set value:

1,4...1,7 k Ω

Is measured value within set-value tolerance?

Continued on next picture page

* Trouble-shooting:

If required, generate charge pressure as follows:
Connect control unit and leave engine running for approx. 1 minute. To make sure that pressure is available, a pressure test must be conducted (see "Test accumulator charging control").

For further testing, disconnect controller plug from test adapter.

Test following leads with ohmmeter for continuity, set value: 0 Ω

- * From controller plug term.8 to ASR hydraulic modulator term.1.
- * Ground cable from ASR hydraulic modulator.

Eliminate open circuits/contact resistances.

- * Measure resistance directly at ASR hydraulic modulator between term.1 and ground. Set value: 1,4...1,7 k Ω
- * Pressure switch or resistor defective:
Exchange ASR hydraulic modulator.

A top-down photograph of a 35-pin control unit plug. The plug is rectangular with a series of pins along its edges. The pins are numbered: 1 at the top left, 18 at the top right, 19 at the bottom left, and 35 at the bottom right. The plug is dark in color.

Top view of 35-pin control-unit plug

A top-down photograph of a plug at the ASR hydraulic modulator. The plug is rectangular and features several components labeled: MR (Master Relay) at the top, VR (Voltage Regulator) at the bottom, and K4 (Solenoid) on the right side. There are also various terminals labeled with numbers and letters, such as 87, 86, 12, 10, 8, 6, 4, 2, 11, 9, 7, 5, 3, 1, 87a, 86a, L2, L1, O3, O85, O87, O30, O85, and O1. The plug is dark in color.

Top view of plug at ASR hydraulic modulator

C05

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C06

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Dynamic test of ASR 2-DKB

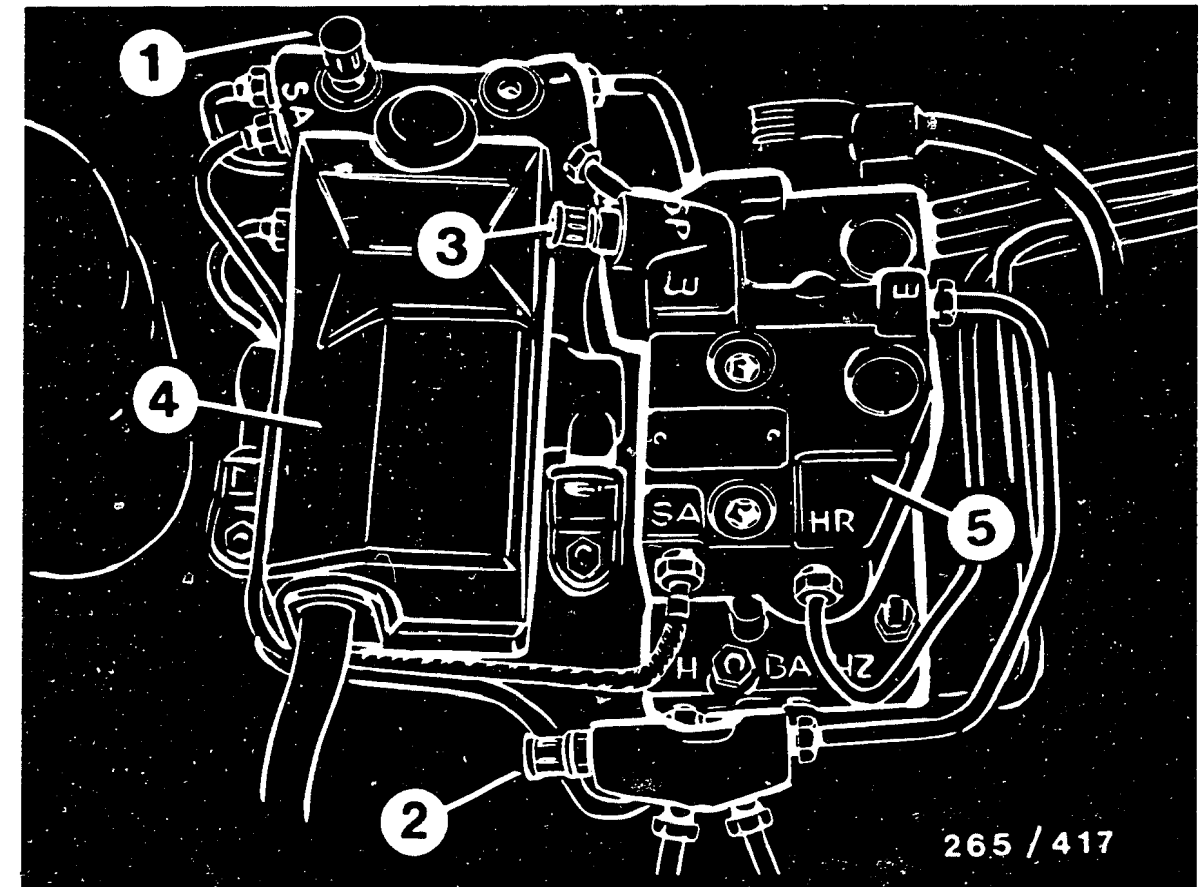
Test requirements:

- +Test using universal test adapter.
- +ABS/ASR controller connected.

Test sequence:

1. Dynamic test of system operation:

- +Rear left wheel must be clear of the ground.
- +Set the selection lever of the transmission to N.
- +Switch on ignition.
- +Spin the free wheel quickly by hand.
- +Wheel must be briefly braked by ASR control.
- +Return-supply pump must operate audibly.
- +Test the rear right wheel in the same way.
- +Switch off ignition.



- 1 = Bleeder screw 1
- 2 = Bleeder screw 2
- 3 = Bleeder screw SP3
- 4 = ABS hydraulic modulator
- 5 = ASR hydraulic modulator

2. Testing accumulator charging control:

- +Switch off ignition.
- +Connect hose to bleeder screw SP3 (on ASR hydraulic modulator) and dangle into container.
- +Open connection SP3 carefully and reduce pressure.
Caution! High pressure up to 200 bar possible!
- +Connect pressure gauge (up to 250 bar) to connection SP3.
- +Fill up brake-fluid reservoir to a maximum mark.

2. Testing accumulator charging control (continued):

+Start engine.

+Measuring timing:

- ++As soon as the engine is running, the accumulator is charged. After 1 to 2 seconds, the pressure must have risen to higher than 90 bar.
 - ++Afterwards, the pressure rises more slowly: Within 7 to 15 seconds, the pressure must rise to 150 to 185 bar (subsequent charging possible). Set values apply at room temperature.
- +Switch off engine, switch off ignition.

Caution! If the pressure rises above 250 bar, switch off the ignition immediately! Pressure switch defective.

3. Measuring pressure loss.

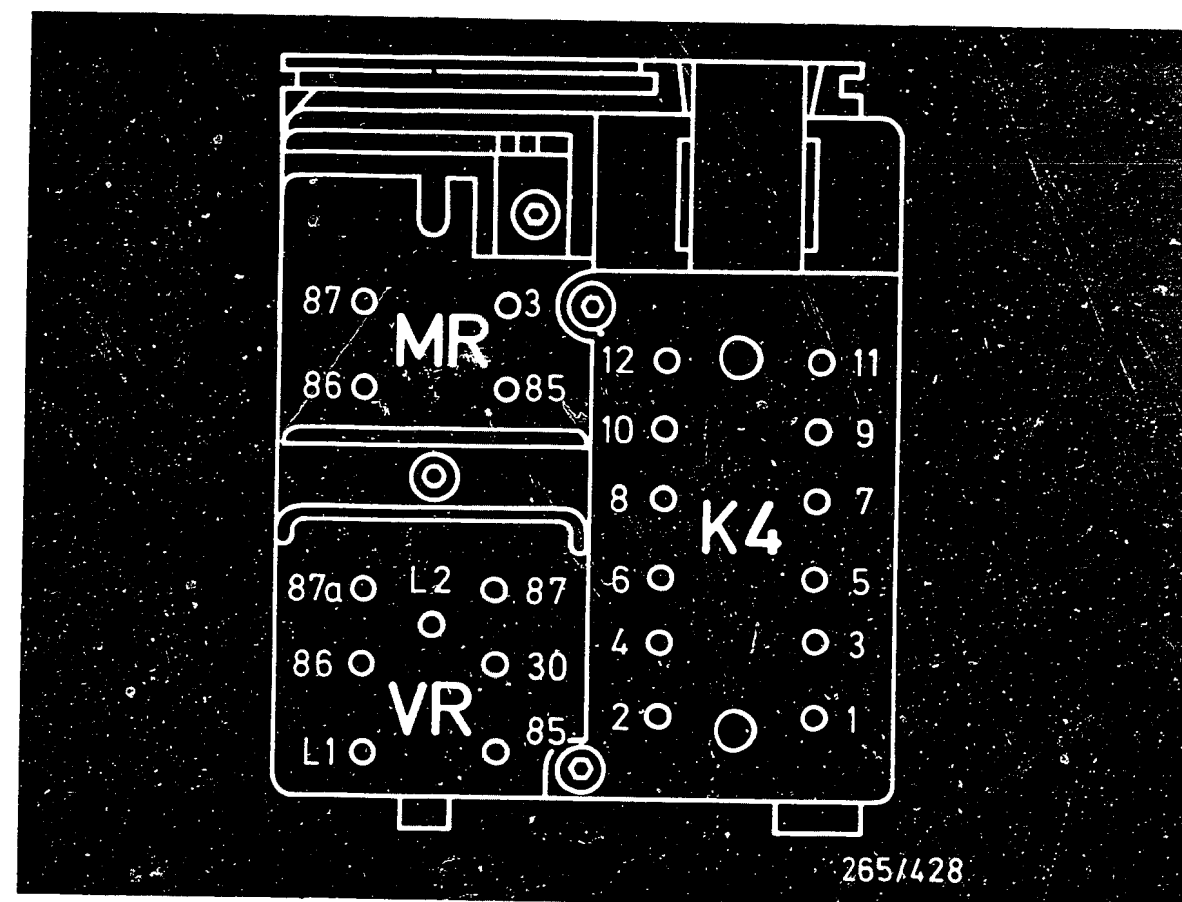
The pressure may drop by a max. of 6 bar (taking 150...185 bar as the basis) within 5 minutes. Measurement applies at room temperature.

4. Removing pressure gauge.

- +Reduce pressure by means of bleeder screw (installed in the pressure tester).
- Caution! High pressure up to 200 bar possible!
- +Unscrew pressure gauge.
 - +Reseal connection SP3 with bleeder screw.

5. Top up brake-fluid reservoir if necessary.

6. Start engine and leave to run until accumulator is full. Subsequent charging possible.



Top view of pluggable printed-board assembly of
ABS hydraulic modulator:

MR = Motor relay

VR = Valve relay

K4 = Hydraulic-modulator plug

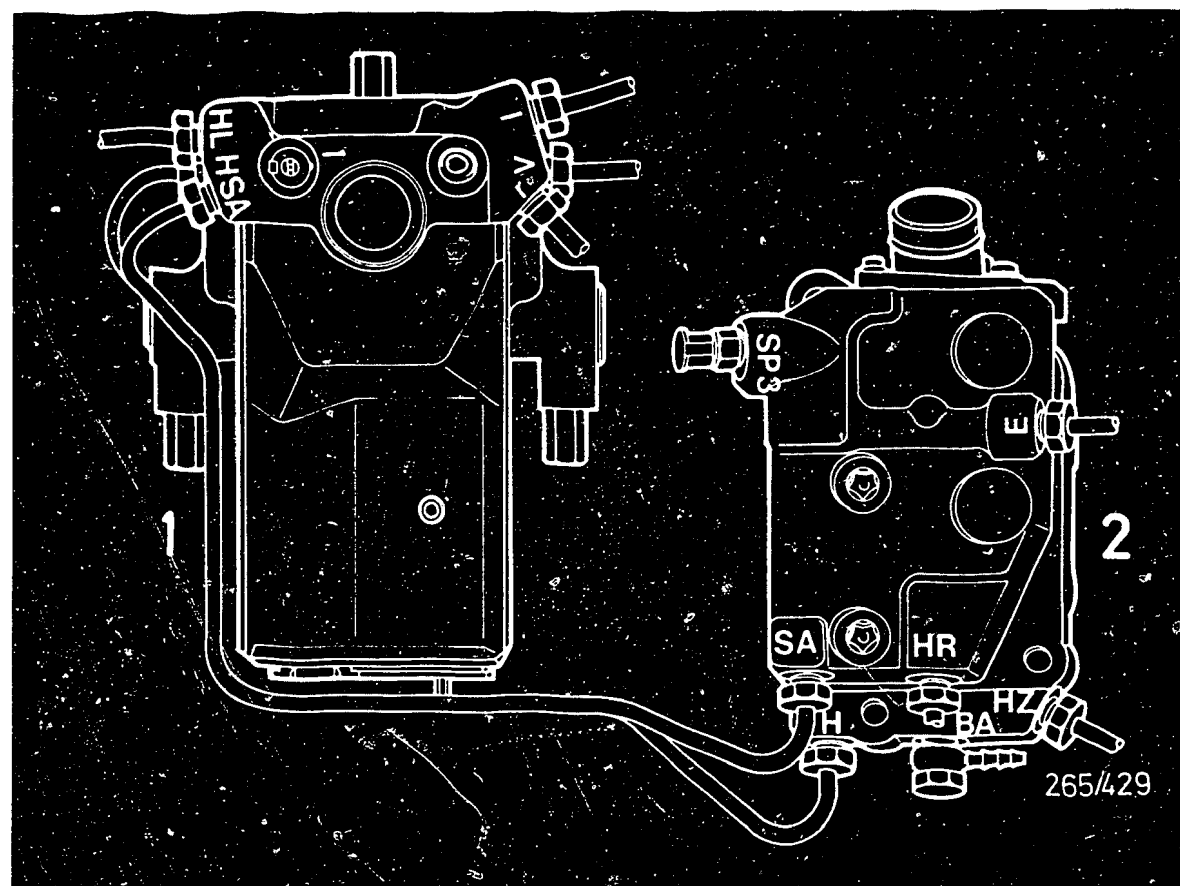
Exchange of the ABS/ASR hydraulic modulators

- * For safety reasons, the hydraulic modulators must not be repaired, but be exchanged only as complete units.

Excepted from this are the motor relay and the valve relay.

Both relays may be exchanged.

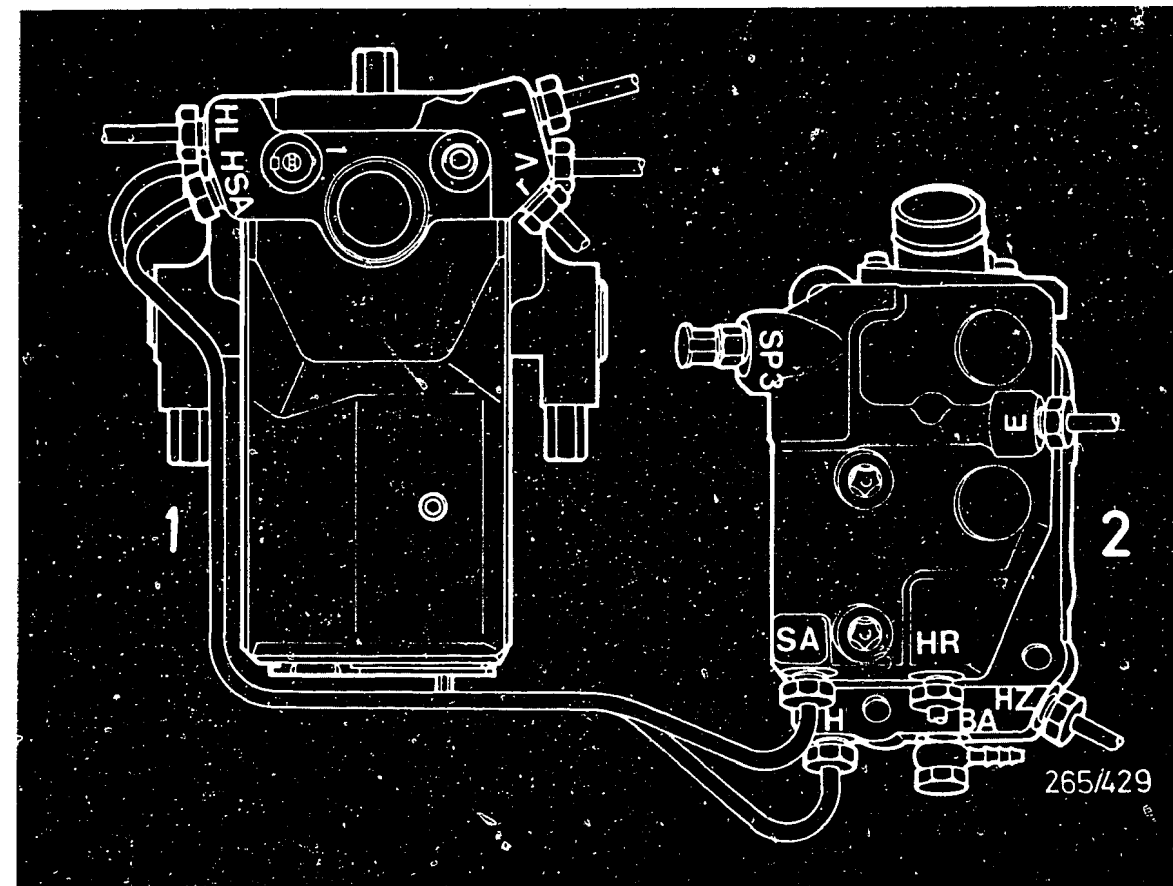
- * Apart from the brake-line connections, no screws at the hydraulic modulator may be loosened. Once they are loosened, it is impossible to make the brake circuits leak-free ever again.
D a n g e r o f f a t a l a c c i d e n t !



1 = ABS hydraulic modulator
2 = ASR hydraulic modulator

- * Check the hydraulic modulator and brake-line connections for leaking joints (visible examination).
If brake fluid is escaping, the brake-line connections must be tightened (12...16 Nm) or replaced or the hydraulic modulator exchanged.

Located at the bottom of the ABS hydraulic modulator is a bleeder bore to the pump piston. It is possible that a small amount of brake fluid escapes at this point. A complaint in this respect is justified only if a puddle of brake fluid forms beneath the hydraulic modulator after actuating the brake pedal several times.

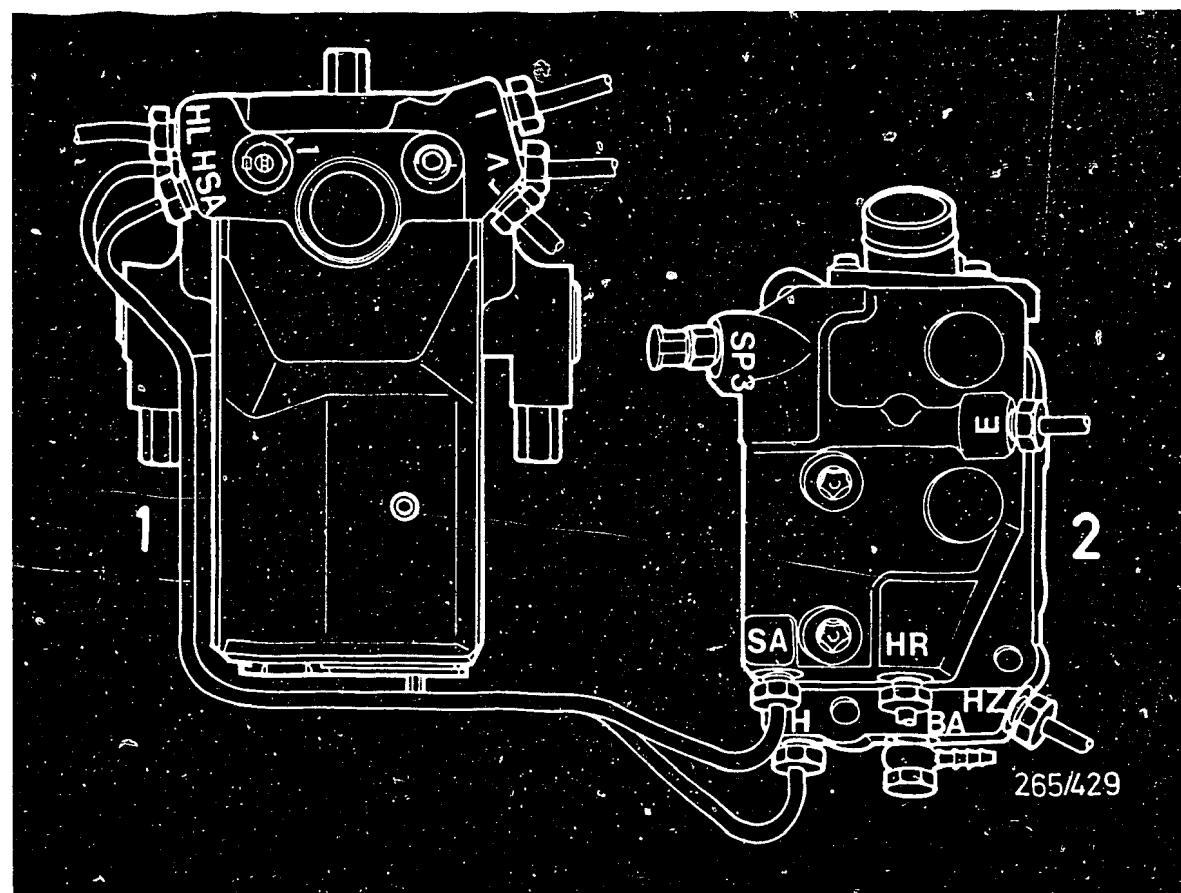


1 = ABS hydraulic modulator
2 = ASR hydraulic modulator

- * When removing and installing the brake linings, make sure that the lines are marked with the corresponding markings from the hydraulic modulator and reconnected correctly assigned (e.g. connection "1" of the hydraulic modulator must be connected to the front left wheel-brake cylinder).

- * Identification markings on the hydraulic modulators:

BA = Container connection
E = Accumulator connection
H = Interconnection between the hydraulic modulators
HL = Connection to the rear left wheel-brake cylinder
HR = Connection to the rear right wheel-brake cylinder



1 = ABS hydraulic modulator
2 = ASR hydraulic modulator

* Identification markings on the hydraulic modulators (continued):

HZ = Connection to the brake master cylinder
(rear-axle circuit)
l = Connection to the front left wheel-brake
cylinder
r = Connection to the front right wheel-brake
cylinder
SA = Interconnection between the hydraulic
modulators
V = Connection to the brake master cylinder
(front-axle circuit)

* Before loosening brake lines at the hydraulic modulators, the charge pump or the pressure accumulator, the pressure accumulator must be emptied.
Caution! High pressure up to 200 bar!
Switch off ignition. Open bleeder screw SP3 at ASR hydraulic modulator approx. 1 rotation and let the brake fluid flow into a container.

* Use only the 9 x 11 mm double-head box wrench for loosening and tightening the brake lines.

* Mark the brake lines and loosen them at the hydraulic modulator.

* Catch the brake fluid and do not allow it to come into contact with the skin, clothing or the paintwork!

* Seal off the brake lines and connections immediately with dummy plugs.

* Disconnect the ground cable from the ABS pump motor.

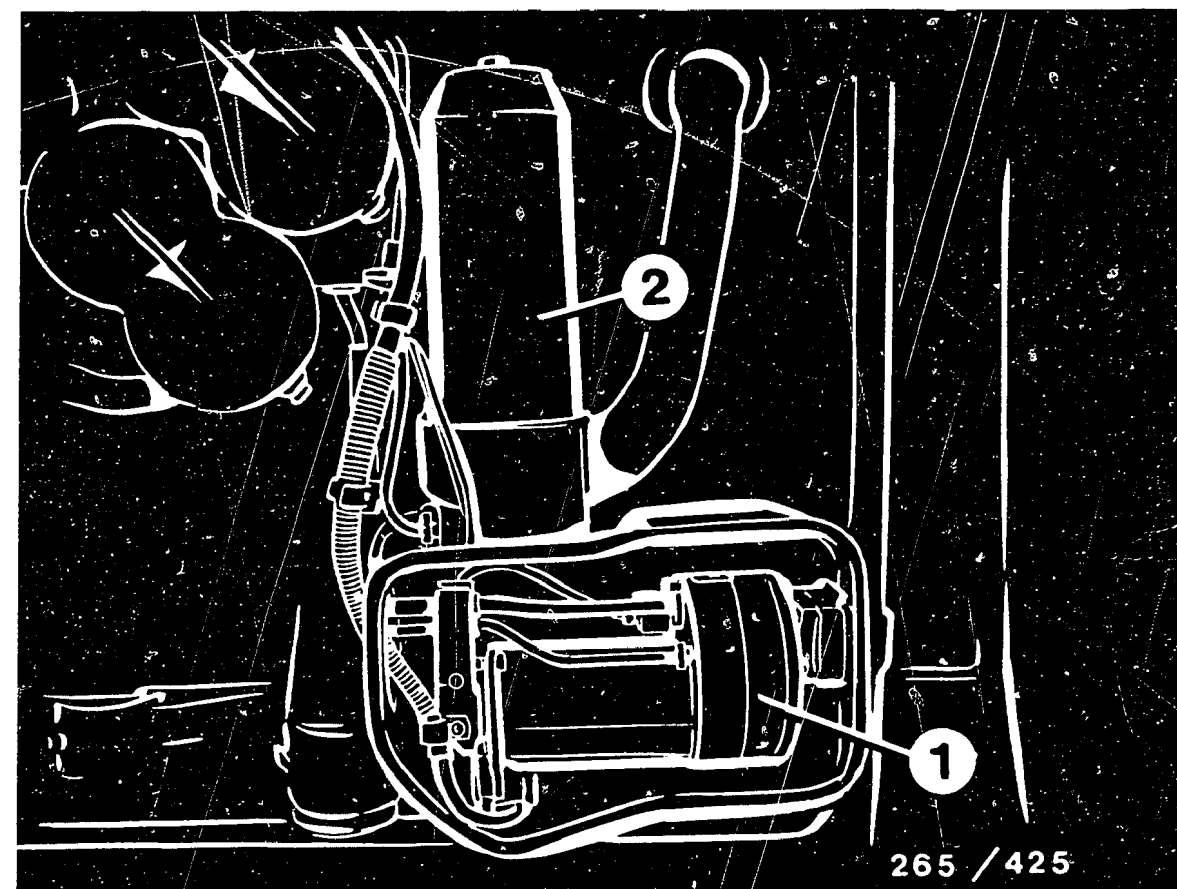
* Loosen the fastening screws of the ABS hood and remove the hood.
Loosen the clip and remove the plug.

* Disconnect the plug-in connection from the ASR hydraulic modulator.

* Loosen the fastening nuts of the hydraulic modulators and remove the hydraulic modulators from the mounting.

Installing

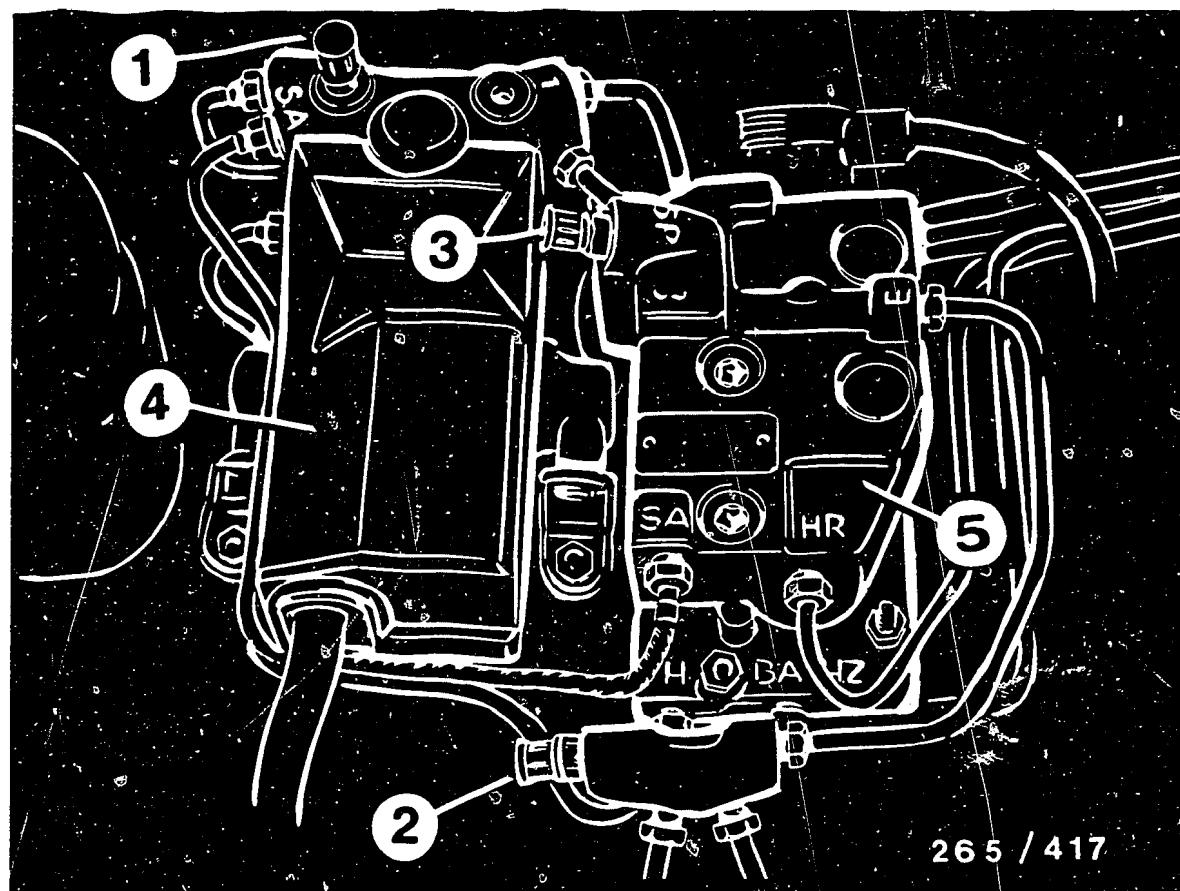
- * Insert the hydraulic modulators into the mounting and secure.
- * Connect the ground cable to the pump motor. Connect the plug and secure to the ABS hydraulic modulator with clip.
- * Mount hood with screw on the ABS hydraulic modulator.
- * Connect the brake linings to the hydraulic modulators, matching up the identification markings.
- * Observe tightening torque for brake-line connections on hydraulic modulators: 12...16 Nm.
- * Bleed the brake system in accordance with the special specifications and check for leaks.
- * Check the ABS/ASR completely with tester.



- 1 = Charge pump
2 = Pressure accumulator

Exchanging the ASR charge pump and ASR pressure accumulator.

- * Before loosening the brake lines at the hydraulic modulators, the charge pump or on the pressure accumulator, the pressure accumulator must be emptied.
Caution! High pressure up to 200 bar!
Switch off engine. Open bleeder screw SP3 on ASR hydraulic modulator approx. 1 rotation and let the brake fluid flow into a container.
- * To remove the modulators, remove the plastic covering beneath the left-hand front fender.



- 1 = Bleeder screw 1
- 2 = Bleeder screw 2
- 3 = Bleeder screw SP3
- 4 = ABS hydraulic modulator
- 5 = ASR hydraulic modulator

Exchanging the ASR charge pump and ASR pressure accumulator (continued):

- * Mark the brake lines:
 - E = Accumulator connection
 - P = Pressure connection
 - 1 Connection to the reservoir
 - 1 Connection to the branch piece with bleeder screw 2
- * Use only the specified 9 x 11 mm double-head box wrench for loosening and tightening the brake lines.

Exchanging the ASR charge pump and ASR pressure accumulator (continued):

- * Catch the brake fluid and do not allow it to come into contact with the skin, clothing or the paintwork!
- * Seal off the brake lines and connections immediately with dummy plugs.
- * Loosen the frame of the assemblies from the projecting mounting.
- * The charge pump and pressure accumulator can be exchanged separately.
The pressure accumulator is mounted on the frame by 2 screws.
- * Caution!
The pressure accumulator must not be disassembled, because of the high gas pressure within (60 bar)! Observe the warning sign.

REPAIR PROHIBITION / MAXIMUM ALLOWABLE STORAGE TIME FOR ABS HYDRAULIC MODULATORS

13....39
VDT-I-265/102 En
1.1986

Replaces edition of 7.1984

1. Repair prohibition

ABS for passenger vehicles is a safety system.

Unauthorized tampering with ABS components brings with it the danger of impairment of the proper functioning of the ABS system.

For reasons of safety, therefore, the
hydraulic modulator may under no circum-
stances be repaired, but instead must be
exchanged as a complete unit.

Only the engine and valve relays may be exchanged.

No other screws or plugs may be loosened or removed.

2. Maximum allowable storage time

The maximum allowable storage time for hydraulic modulators is 5 years from the date of manufacture (FD) specified on the product.

This requires that the following storage conditions be fulfilled:

- Hydraulic modulator filled with brake fluid (supplied in filled condition).
- Vertical/upright position (hood on top).
- Ambient temperature between -20°C and +50°C.
- Dry storage.

After 5 years storage time, all rubber and plastic parts must be replaced and the hydraulic modulator must be subjected to a functional test.

The replacement of rubber and plastic parts and the functional test can be carried out only at the place of manufacture. After testing, the hydraulic modulators are marked with |L| and a new date of manufacture (FD).

Service workshops in the Federal Republic of Germany should send the hydraulic modulators to:

Robert Bosch GmbH Abt. K1/VAK 2,
Robert-Bosch-Straße, 7141 Schwieberdingen.

Service workshops in other countries are requested to send the hydraulic modulators to:

Robert Bosch GmbH, KH/LAV 2 - Auspackraum,
z.W. an K1/VAK 2, Auf der Breit 4,
D-7500 Karlsruhe 41
West Germany.

The hydraulic modulators should be sent to us pre-paid. Please refer to this Technical Bulletin on the enclosed delivery ticket.

A fee is charged for parts replacement and functional testing.

Responsible:

ROBERT BOSCH GMBH

Division KH

Technical After-Sales Service (KH/VKD 2)

Please address questions and comments concerning the contents to our authorized representative in your country.

MERCEDES-BENZ VEHICLES,
TYPE W 126 / C 126
ANTI-SKID SYSTEM (ABS) WITH
ELECTRONIC TRACTION CONTROL (ASR)

Motor vehicle: Pass. Car
12.1987

Procedure for after-sales service

Since mid-1987, the vehicles of the W 126 and C 126 (V8 with automatic transmission) series equipped with ABS as standard have been equipped with E Gas and ASR as optional extras.

The electronic traction control system is described in detail in the Service Information Sheet entitled "New Product".

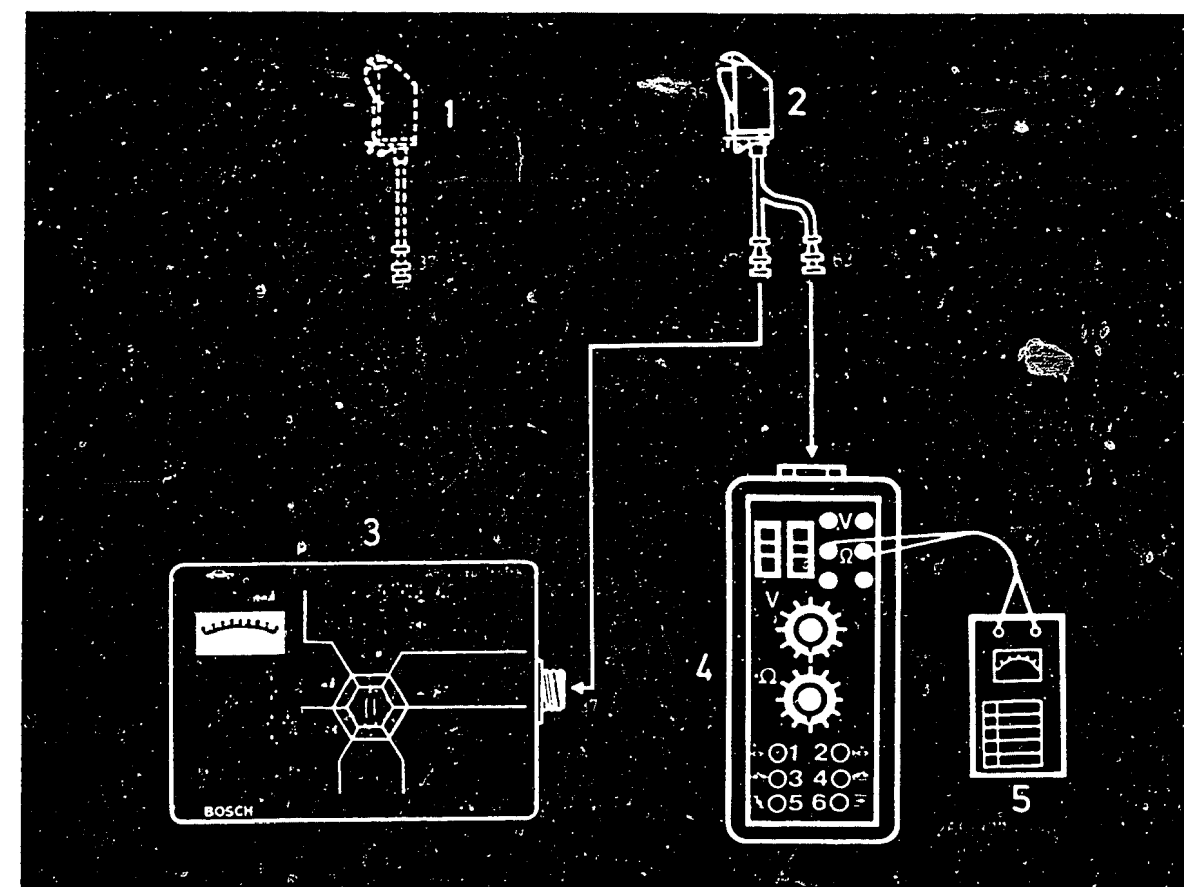
Additional ASR components

The usual ABS components remain unchanged and are joined by the following new ASR components:

- ASR hydraulic modulator
- ASR pressure-supply system consisting of:
 - * ASR high-pressure charge pump
 - * ASR gas-filled floating-piston accumulator.

Just like the ABS components, these ASR components must not be repaired.

A special ABS hydraulic modulator has been adapted for the vehicles equipped with ASR. This special hydraulic modulator must not be installed in vehicles without ASR.



- 1 = Test lead for ABS2 LED tester, 35-pin (is not required)
- 2 = Test lead for ABS/ASR, 35-pin
- 3 = ABS2 LED tester (tests ABS2 part)
- 4 = Universal test adapter (tests ASR part)
- 5 = Multimeter

Testers ABS/ASR

Alongside the ABS2 LED tester KDAS 0003, the following testers are required for testing the ABS/ASR:

- Universal test adapter Part.No.0 684 101 801
- Test lead
- Multimeter
- Combination pressure tester W 0112 (FAG or other manufacturer)

The necessary test lead is expected to be available as of spring 1988. Until it is delivered as standard, the test lead with provisional test instructions may, if required, be requested from

Reinhold Mack GmbH & Co
Jahnstr. 144
D-7320 Göppingen
Tel. 07161/78051
Telex 727865 mackd.

The fact that the ABS/ASR system is an item of safety equipment forbids the use of any method of makeshift trouble-shooting.

Technical Documents

Testing / Repairing	SIS-KFz ...
Equipment	AP ...
Specifications	KE ...
Exchange	Exchange list
Product/Application	GD ...

Warranty procedure

Components on which a claim is being made should be sent for inspection during the warranty period to:

In the Federal Republic of Germany:

Robert Bosch GmbH
K1/VAK
Robert-Bosch-Straße
D-7141 Schwieberdingen

together with warranty application, goodwill application and delivery note KH/VKD3.

In all other countries, components on which a claim is being made should be sent to our representative in your country who should forward it to:

Robert Bosch GmbH
KH/LAV - Auspackraum
zur Weiterleitung an K1/VAK
Auf der Breit 4
D-7500 Karlsruhe 41

together with warranty application, goodwill application and delivery note.

Published by:

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INDEX

Coordinates

ABS hydraulic modulator	C10
ASR hydraulic modulator	C10
Charge pump	C16
Controller	B09
Indicator lamps	B01
Pressure accumulator	C16
Snow-chains switch	B03
Universal test adapter	B11

For production reasons:
continued on the following
coordinate.

TABLE OF CONTENTS

Section	Coordinates
Bleeding specifications.....	A01
How to use the microcard.....	A02
Installation position of components.....	A03
Safety and precautionary measures.....	A04
Special features.....	A08
Test equipment and tools.....	A11
Trouble-shooting:	
ABS/ASR indicator lamps.....	A13
Customer complaint.....	A17
Diagram of hydraulic connections.....	B01
Dynamic testing.....	B03
Exchange of ABS/ASR hydraulic modulator.....	B04
Exchange of ASR charge pump and ASR pressure accumulator.....	B05
How to use the test chart for the universal test adapter.....	B07
Index.....	B08
Snow-chains switch.....	B11
Structure of microcard.....	C07
Technical Bulletins.....	C10
Test chart with universal test adapter.....	C16
Test procedure.....	N01
Test requirements.....	N26

IMPRESSUM

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